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The Dock & Harbour Authority

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GAINSBOROUGH
FLOOD PROTECTION
SCHEME
This aerial view, taken at Gainsborough, shows parts of the 2,000 ft. length of river wall that was reconstructed with Larssen steel sheet piling. The sections used were No. 1U, No. 2 and No. 3 in lengths up to 42 ft.
Authority :
Trent River Board, Nottingham.
Consulting Engineers :
Lewis & Duvivier, MM.I.C.E., London, S.W.1.
Contractors :
Concrete Piling Co. Ltd., London, S.W.1.
BSP

THE BRITISH STEEL PILING COMPANY LIMITED, 10 HAYMARKET, LONDON, S.W.1

SILT FROM PORT SWETTENHAM

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Port conditions—and problems too—vary so much and change so often that only the Priestman system could be expected to cope with the many difficulties which beset the Dock and Harbour authority . . . It is more than coincidence that there's hardly an important port in the world which doesn't depend upon—and bless—the reliability and efficiency of Priestman equipment.

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Editorial Comments

Engineering and Mechanical Aids to Cargo Handling

The Institution of Civil Engineers is to be congratulated on four informative and authoritative papers on different aspects of cargo handling which were presented to the Maritme and Waterways Division on the 20th March, 1956. Extensive extracts from all four papers are published in this issue by the kind permission of the Institution.

It is noteworthy that the statements and arguments which are put forward in some of the papers are developments of articles which have appeared in this Journal during the last few years. For this reason, a number of the photographs are similar to those which have already been used to illustrate certain features.

It was evident from the vigour of the discussion which followed the reading of the papers that maritime engineers are alert to the possibilities and problems presented by the development of modern cargo handling equipment, in particular the fork lift truck and the mobile crane. It is comforting to note that much thinking has been, and is being, done to ensure that British ports are not lagging in the introduction of modern equipment and in developing their installations to take full advantage of new aids to efficient dock working.

It is to be hoped that their efforts will not be hindered by a less progressive attitude on the part of dock labour.

Productivity in the Port Industry.

The British Productivity Council's team, which recently made a review of the Port Industry, undertook a formidable task. Transport is Britain's largest industry for, as stated in their Report, "with the exception of completely assembled motor vehicles, railway rolling stock, ships and aircraft (together, of course, with mains, electricity and gas supplies), everything produced in this country and not intended for use within the producing organisation has to be moved."

Revolutionary changes in goods handling methods are at present taking place all over the world. The subject is therefore urgent and topical, and the team has dealt with it comprehensively. The section on the docks reviews the facilities provided in British ports, particularly mentioning improvements made since the conclusion of the last war. These improvements have indeed been necessary, for British docks are today handling 50 per cent. more import tonnage and over 100 per cent. more export tonnage than pre-war.

It is interesting to observe the reactions to this Review of some influential bodies. At a press conference held in London recently in connection with the Review, Lord Waverley, Chairman of the Port of London Authority, mentioned that in the year ended 31st March, 1956, shipping using London had totalled 70½ million tons and the cargo handled had amounted to nearly 54 million tons. To meet the handling demands of such tonnages, the Port Authority had spent £3½ million since 1945 on new equipment alone. At the same conference, Mr. Frank Cousins, acting secretary, Transport and General Workers' Union, emphasised that the introduction of mechanical handling had to be gradual. This, of course, is true but port interests must take care that "gradual" does not mean "delayed."

Reference to the Review was also made by Councillor Herbert Beynon when he delivered his presidential address to the members of the Cardiff Incorporated Chamber of Commerce. Dealing with the problem of congestion at the country's major ports, the president said that it would be in the national interest that greater use should be made of those ports which are not working to capacity. "It is inexplicable that all investigations of port conditions and efficiency appear to concentrate on those which are already overloaded and not on those which can provide facilities without the dislocation of existing trade. The recent report of the British Productivity Council on freight handling makes little, if any, reference to the South Wales docks. Referring to the need to reduce the number of unremunerative days spent by ships in port, this report states 'efforts to meet these requirements have been hampered to some extent by labour shortage.' Had the authors of the report troubled to take expert advice on the South Wales ports, they might well have qualified this statement, particularly so far as Cardiff docks is concerned."

Substantial extracts of the Review are given on a following page. "Ideally," its last paragraph states, "the future should see a closely-integrated transport system operating in this country . . . ; its aim should be precisely that of the International Chamber of Commerce in its wider sphere: 'a service with obligations'."

Centenary of The Missions to Seamen.

Known affectionately the world over as "The Flying Angel," the Missions to Seamen, with a long and impresssive record of service already established, is celebrating its Centenary year by a series of services and public meetings which are being held at many centres in the United Kingdom and also along the trade routes of the world.

H.R.H. The Duke of Edinburgh has honoured the Society by accepting the Presidency for the Centenary year, and at a luncheon held in London last April for leading international and business interests who were asked to support the Missions' work, he said, "there is a real need for some form of welfare service for all seamen both in ports at home and in foreign ports, and the Missions to Seamen is the finest body to do this work, equipped by the experience of 100 years. Their plans for the future are realistic and sensible, but the real difficulty is that the Society is short of funds and short of men of the right sort."

The new headquarters of the Society in Belfast, which cost £37,000, was also opened during April by the Duke. This new building is typical of the expanding facilities offered by the Society and, as will be seen in the article on a following page, other examples are to be found at many ports abroad.

Presenting the report for last year at the annual meeting of the Society, the Rev. Cyril Brown, general superintendent, said that 1954's increase in voluntary gifts to the Society of some £4,000 had been equalled in 1955, and nearly £25,000 has already been promised towards the Centenary appeal which the Society will be launching shortly. It has frequently been emphasised that the Missions to Seamen is not supported by government grants and depends solely upon voluntary subscriptions and donations. It is to be hoped, therefore, that this appeal will meet with a generous response.

Editorial Comments—continued

Flags of Convenience

In this issue will be found an analysis of a subject which is now in the forefront of the shipping world—flags of convenience. The growth of the practice of shipowners registering their ships under the flags of the countries which offer the inducement of virtual freedom from taxation and, in the case of the high-cost countries, the opportunity of operating expenses which are competitive with Western European standards, has been described as one of the most startling phenomena of the post-war era. It is certainly bordering on the fantastic that Liberia, for example, should emerge as a country with a substantial mercantile marine; that four countries (including Liberia) whose combined fleets in 1939 totalled only some 750,000 gross tons should now have 9½ million gross tons —half of it tanker tonnage; and that the fleets of Panama and Liberia should each now exceed those of all the traditional maritime countries, with the exception of the United Kingdom, the United States and Norway.

It would seem clear that the avoidance of taxation is almost certainly the principal motive for this departure from the normal routine of registering a ship in the country where she is owned. The ability to do so confers an enormous advantage; the money which would have gone in paying taxes at home can be used to replace ships at a rate quite beyond the means of shipowners who are tied to the national flag, and modern ships, in times of depression could continue in service long after the older and less economic had had to give up. Much thought is being devoted to the whole matter internationally, but there seems no easy answer.

Enforcement of Oil in Navigable Waters Act

The Minister of Transport and Civil Aviation recently announced in the House of Commons that he is shortly to bring into operation the Oil in Navigable Waters Act, 1955, and make a number of regulations under it. The order and regulations will not, however, become operative for three months, because advance advice of their provisions must be given to the masters of United Kingdom registered ships wherever they may be.

The regulations will require dry cargo ships registered in the United Kingdom which use oil fuel tanks for water ballast to be equipped with oil and water separators. Such separators are not necessary in other ships and the Minister does not intend to extend the requirement to ships of foreign flags when using British ports.

Of the forty nations who attended the last conference, Great Britain will be the first to sign the Convention and to issue these regulations. However, until the other nations have also ratified the Convention, and until there is total prohibition of the discharge of oil into coastal waters, a considerable problem still remains and complete satisfaction cannot be expected. It is to be hoped, therefore, that the example set by Great Britain will be speedily followed by all those countries who signified their support.

New Administration for Australian Dock Labour

A Bill was introduced recently in the Australian House of Representatives authorising the adminstration of Australia's waterfront by a new body charged with increasing efficiency, investigating delays and encouraging safe working The new body, called the Australian Stevedoring Industry Authority, will replace the Stevedoring Industry Board.

Introducing the Bill, the Minister of Labour and National Service, said the authority would consist of a chairman and two members — one representing management, the other associated with trade unions. They will be appointed by the Governor-General for a period not exceeding seven years. On the advice of the Commonwealth Law Office, the Bill does not provide for any system of fines for breaches of discipline, as recommended by the special committee which investigated waterfront conditions. The Minister said fines were impracticable and the Government proposed to adhere to present arrangements for the cancellation or suspensions of registrations. He added that fines were more appropriate for employers and the Bill provided for fines ranging from £A100 to £A1,000 for employers who did not carry out their obligations.

Other provisions of the Bill include The Waterside Workers' Federation (the dockers' union) to retain the primary responsibility for recruiting labour. If the union fails, the statutory authority will recruit labour. The Press and radio pick-up system for notifying dockers when they are required will be extended. Short term registrations of labour for up to six months and engagement of supplementary labour for evening and week-end work for use in emergency is provided for; to meet dockers' objections the minimum wage will be guaranteed for four weeks succeeding the last use of supplementary labour.

It is unfortunate that the proposed legislation does not meet with the approval of the Waterside Workers' Federation, who claim that the Bill will not solve waterfront problems but will create them, as it will have the effect of taking away the rights of trade unions. Wild statements such as these seem to be in line with the recalcitrant attitude adopted by Australian dock labour for many years past.

Topical Notes

Coastal Shipping and Coal Bunker Prices

A press announcement by the Chamber of Shipping of the United Kingdom states that the further increase in coal prices early this month does not affect foreign-going ships, but raises the average price of coastwise coal bunkers by 6s. 8d. per ton. This increase comes at a particularly unfortunate time, for coastal freight rates are not due for revision until November. For several months, therefore, coastal shipowners will have to bear the extra cost. Attempts to stabilise coastal freight rates are defeated when arbitrary increases in fuel costs are made. A substantial proportion of the coastal fleet burns coal and the extra financial burden will be heavy.

Changed Status of Ports in Egypt and Ceylon.

Significant economic changes will undoubtedly result from the withdrawal of British naval and military forces from Egypt and, as is expected at a later date, from Ceylon.

In an endeavour to encourage trade and to counteract loss of revenue, which hitherto has been forthcoming from British Forces resident in the Canal Zone, it is reported that the Egyptian Government is planning to turn Port Said into a Free Port. According to reports from Cairo, Port Said would be connected by new roads to agricultural centres in the Northern Delta. The Government is also said to be preparing plans for land reclamation near Ismailia and for building factories at Suez.

In the case of Ceylon, it is proposed that the naval base at Trincomalee on the east coast will be developed into a commercial port to handle merchant shipping when it has been handed over to Ceylon by the British Government. It is hoped to undertake the work of conversion during the next financial year, provided that by that time the negotiations are completed between the Ceylon Government and the United Kingdom Government over the transfer of the harbour.

Antwerp Port Extension Programme.

Negotiations have been proceeding for some time between the City of Antwerp and the Belgian Government, on the question of obtaining credits to enable a large scheme of port development to be undertaken. These have now reached the point where the Government has announced its decision to introduce a Bill into Parliament to enable the plan to be carried through within the next ten years. It is estimated that the programme will cost 4,200 million francs (over £30 million), of which the Government will contribute 3,500 million francs.

The programme includes the following:—

(1) Construction of the fifth harbour dock, with industrial basin and laying out sites, and equipping with cranes, sheds and electrical installation. It is envisaged that a sixth dock will be constructed at a later date.
(2) Extension of conveyor bridges on the quays.
(3) Laying out sites at the entrance to the oil dock.
(4) Purchase of new floating equipment and electric cranes.
(5) New jetty for the South oil undertaking.

Cargo Handling at Ports

Extracts from four papers presented to the Maritime and Waterways Division of the Institution of Civil Engineers

FOUR papers of unusual interest to readers of this journal were recently presented to the Institution of Civil Engineers by Messrs. N. A. Matheson, E. S. Tooth, J. C. Shire and J. A. H. Lees.

The papers presented by Mr. Matheson and Mr. Tooth deal with the problems of cargo handling in ports from the standpoint of the civil engineer and the dock operating official respectively, on broad general lines with strong emphasis on future trends. In the following pages these papers are reprinted almost in full.

The papers by Mr. Shire, which presented the views of the Mechanical Engineer, and Mr. Lees those of the ship designer, were specialised. From these papers extracts have been selected which have direct bearing on the subject of cargo handling.

One aspect of cargo handling which naturally received considerable prominence in the papers and the subsequent discussion was the growing use in our ports of modern mechanical handling equipment, and in particular the fork lift truck and the mobile crane. These machines are, as one author points out, revolutionising cargo handling throughout the world and this has an important impact on the lay-out and design of dock premises.

The large number of variable factors to be taken into account in such planning makes it impossible to produce a blue-print applicable to all ports or even the different sections of a single port. Nevertheless, certain well defined trends are discernible. The need for wide roads and quays, clear shed floors with ample headroom to enable mobile equipment to work inside, large parking areas, well equipped repair and maintenance workshops as part of the port organisation — all reflect the changes in methods that have come about and are in process of developing.

With waterside space often at a premium, the two-storey transit shed is receiving close attention with its special problems of taking delivery and discharging cargoes on the landward side.

Perhaps the most significant feature of all is that some British ports are developing and indeed pioneering the use of methods of cargo-handling, which will only be fully developed when goods are palletized at the factory and are shipped and delivered to the customer as unit loads.

Civil Engineering Structures

By N. A. MATHESON, M.I.C.E., M.I.Mech.E.
(Chief Engineer, Port of Bristol Authority).

Introduction

Some of the principal factors which must be known or carefully assessed in preparing any layout for general cargo-handling are:

(1) The total area available.
(2) The types and volume of cargo to be handled.
(3) The extent to which export as well as import cargo must be catered for.
(4) The methods to be used for discharging and loading cargo.
(5) The amount of cargo requiring transit, short- and long-term storage.
(6) The amount of cargo to be handled by road, rail, and barge.
(7) The extent to which direct working between ship and shore transport or barges will take place.

These factors are so variable that it is obvious that nothing in the nature of a standard specification can be drawn up, and that each port—indeed almost each berth—will require individual consideration and a particular layout.

The forms of transport to be used in clearing and bringing goods from and to berths and sheds have naturally a tremendous bearing on the layout of dockside areas. Indeed, except for certain considerations related to the design of sheds, warehouses, and other buildings, transport methods almost wholly determine the layout to be adopted. It is certain, for example, that many ports today operate at less than full efficiency because they were primarily designed to deal with a very high percentage of rail-borne traffic and cannot readily be adapted to cope with the vast increase which has, comparatively suddenly, taken place in the use of road transport.

Most modern docks handling a large and steady volume of general cargo require:

(1) Good main and access roadways.
(2) Good internal and main-line railway facilities.
(3) Extensive, easily worked transit (and often warehouse) accommodation.
(4) Fast-working cranes of adequate capacity and out-reach (say, 3 tons at not less than 65-ft. radius); also modern mechanical appliances for handling cargo on quays and in sheds.

Since space is almost invariably of utmost value in and near waterside areas, there should never be preconceived ideas about layout. Once the main commercial requirements have been made known, the engineer should prepare, within the limitations of any site, as many variations of layout as will reasonably fulfil these demands. No doubt the best engineering layout will ensure the smoothest and quickest means of working; but with these desirable provisions must be coupled the greatest revenue-earning capacity and consideration for the needs of possible future extensions and developments. The prosperity and efficiency of a port are sometimes gauged by the amount of cargo passed over a unit length of its total quayage per unit of time, but it is surely a better guide to take in account also the total area occupied by all adjuncts to the quayage. No such figures on the latter basis seem to be available (and admittedly it would be difficult to arrive at a common method of assessment for all ports), but figures varying from 120 tons up to more than 300 tons of cargo per linear ft. of quay per annum seem general in Britain. These figures—while allowing that the types of cargo handled have a marked effect—bear out the need for careful utilization of space, since unless it can be shown that the occupation of greater area will result in a clear increase in the total tonnage of goods handled, or an equivalent reduction in operating costs, the value of the area occupied may be greater than the benefits obtained from improved layout.

Dock Roads

Roadways throughout dock areas must be able to handle inward and outward cargo to the same extent as it is possible, or necessary, to handle such cargo at the berths and sheds. They should be of ample width to allow the free passage of vehicles, and also allow standage space for vehicles waiting to take their turn at berths or sheds. A width of not less than 40-ft. is generally found necessary, but too great a width is undesirable since it often leads to confusion and difficulty of control. Preferably, where road transport is heavy, the roadways themselves need only be of sufficient width for free passage of vehicles and there should be a series of standage areas adjacent to berths and sheds with a form of "call-in" system so that vehicles can be brought up to their required place in the order wanted, or as vehicles which have already completed their duty move away from the dock area (Fig. 1).

With the growing use of road transport and mobile mechanical equipment, it is very necessary that dock roads should be well constructed and maintained. In many cases it is not possible to avoid running plant (such as fork-lift trucks) over main and access roads, sometimes for appreciable distances, aad since these and similar appliances are not usually intended for operation except on smooth

Cargo Handling at Ports—continued

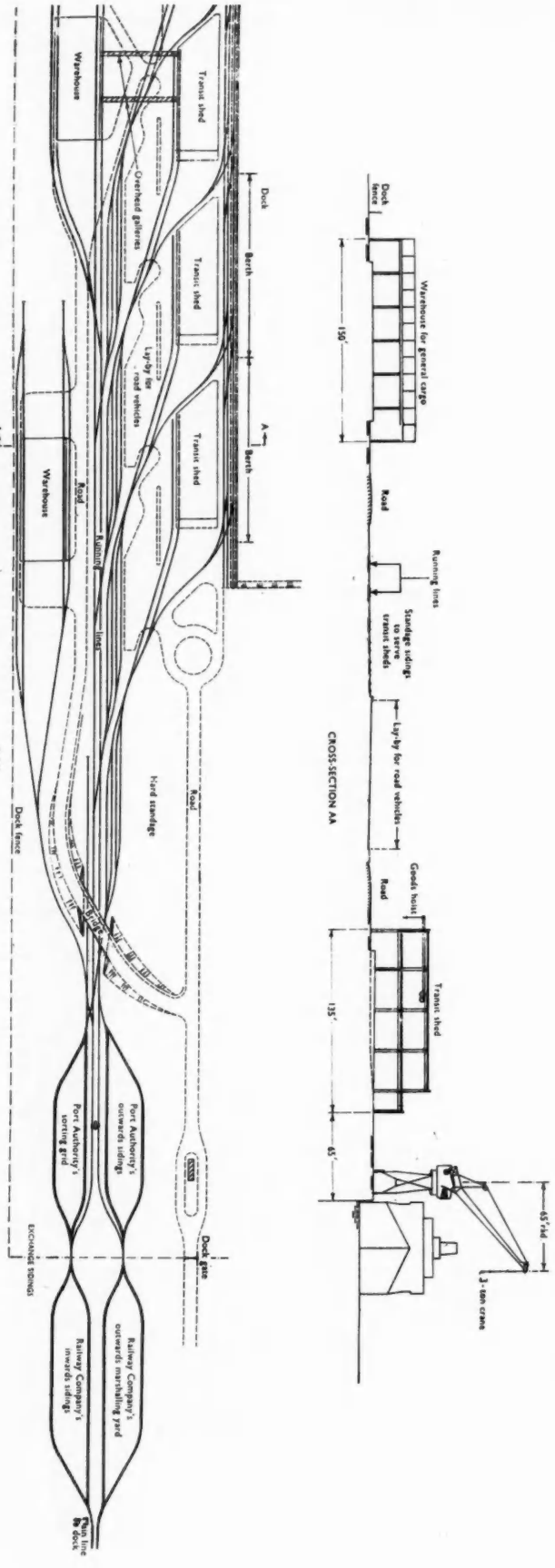


Fig. 1. Diagrammatic Layout of Quay (showing roads, rail tracks, sheds and warehouses).

hard surfaces much damage and costly maintenance may result if roadways are not of a good standard.

Whilst road vehicles are not so restricted as locomotives in regard to movement on gradients and curves, it is desirable to keep these to the minimum, particularly curves, which should be not less than 40-ft. on the inside radius, since otherwise some difficulty may be experienced in handling long and heavy vehicles.

Care should be taken to avoid undue congestion at points where there is unavoidable concentration of road traffic; for example, where it is the custom for vehicles leaving dock areas to be checked and examined some delay necessarily occurs, and near such examination points, therefore, there should be uninterrupted access to and from the main highways or their approaches. A possible source of obstruction is a level crossing (either main line or dock railway) near an examination point, and this should certainly be avoided if at all possible.

Adequate lighting of dock roads is very important, particularly in areas where there is also heavy rail traffic. Roadways should have well-defined kerbs or edgings and be clearly signposted with route and warning notices, as also should access roads to berths and sheds, which must be free from obstructions such as switch levers. The berths, sheds, and warehouses should be clearly marked so as to be easily identifiable from a distance.

Dock Railways

As in the case of roads, dock railways must be capable of handling inward and outward traffic to the same extent as the berths and equipment.

Because of the comparative inflexibility of rail tracks once they are laid, especially if "paved in," it is advisable to ensure that the facilities provided will be sufficient, since otherwise extensions may later prove either impossible or extremely costly. For example, unless the volume and ratio of road and rail traffic on any section of quay is well established and unlikely to alter materially, it would be well to consider in the case, say, of a quay layout requiring at the time only two tracks, the provision of a third track on the space allocated for road transport. This third track would not interfere with the use of the road, but should rail operations at any time increase beyond original requirements the track is there to deal with them, whereas it might be a major work to install a new track on a constructed quay. For the same reason, sorting grids both for internal traffic and at the exchange sidings, where traffic is passed to and from the main-line railways, must be of adequate capacity.

Sorting grids are preferably sited well clear of the berths and sheds, but small standage grids should be laid down near these so that full and empty wagons may be removed from or placed at the berths and sheds at convenient times, thereby reducing delays to ship working and eliminating the waste of having locomotive power always in attendance for the immediate haulage of wagons to and from the main grids (Fig. 1).

Generally, all rail tracks should be paved in wherever there is a likelihood of road transport being used.

It is advisable to allow over-standard clearances on approach tracks to any areas where out-of-gauge loads may have to be handled. Arrangements such as are sometimes possible on main-line railways for dealing with these loads are not always possible on docks, where space is generally more restricted by the presence of permanent and substantial buildings and where, also, the tracks may be paved in.

Curve radii should be as great as possible wherever locomotives are to be used; the type and size of locomotive may have a material effect on the figure to be adopted. For instance, it has been found that diesel and diesel-electric locomotives will distort curves which can be negotiated by steam locomotives of camparable size without any distortion taking place.

Gradients must be kept as low as possible; unless movement of wagons by gravity is to be employed in any area, a gradient of 1-260 should not be exceeded where wagons are to be left standing.

Level crossings, apart from almost invariable difficulties of maintenance, should be kept to the minimum since they are bound to create delays where there is a substantial volume of road traffic.

Cargo Handling at Ports—continued

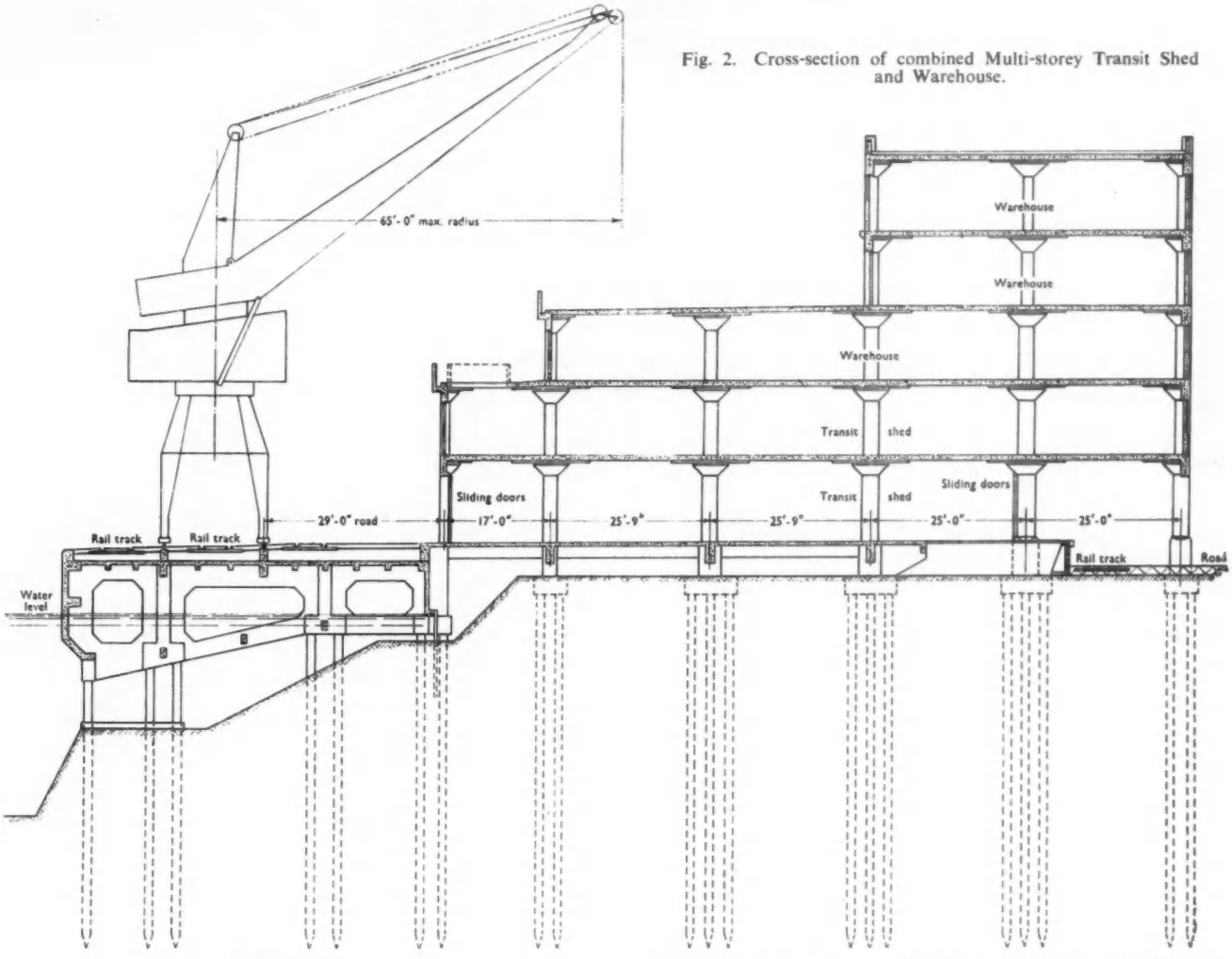


Fig. 2. Cross-section of combined Multi-storey Transit Shed and Warehouse.

Quay Layout

Once the ratio between road and rail transport has been determined as accurately as possible, the facilities to be provided for these on the quay and how they should be laid out in relationship to ship, shed, and cranes, can be decided. Much will, of course, depend on the extent to which goods are to be handled direct between ship and shore transport and the extent to which they are to pass through transit shed or into short- or long-term storage, the volume of export as well as import goods to be handled, to what extent ships' gear is to be used, and to what extent mechanised appliances will be employed.

Unless the volume of goods for rail is very small at least two tracks are necessary on the quay and it is more usual to provide three. In some cases it has even been considered necessary to lay a fourth track, but this is rather unusual and is intended for dealing with exceptional cargoes, which perhaps could not properly be described as "general." However, as already mentioned, if road space has to be provided on the apron, the additional track can be laid therein without either impeding the normal use of road transport or increasing the width of the apron.

If three tracks and a roadway (with or without a fourth track incorporated) are necessary, the apron width should be not less than 65-ft. measured from edge of quay to face of shed. This distance allows ample space between landward (third) track and sheds for road vehicles, which must be able to stand well clear of tracks and shed openings, and in the case of two or multi-storey sheds being used will easily allow cranes of 65-ft. working radius to handle goods on to or off platforms on the upper floors (Figs. 1 and 2).

In order that cranes may have the greatest possible out-reach over holds of vessels, and in some cases be able to handle goods across ships to barges, the outer crane rail should be placed as near the quay edge as conditions will permit, about 6-ft. being usually sufficient for clearing bollards and allowing for the passage of ships' ropes, etc. With this arrangement the outer rail track can still be laid near enough to the quay edge for direct work by ships' derricks to railway wagons (Fig. 1).

Where there is a series of berths "in line," the rail handling to each berth is performed by using one of the tracks as a through track serving all the berths, or providing turn-outs at intervals of two or more berths to through tracks laid clear of the berths and sheds, or providing turn-outs at each berth—or some combination of these methods. The first method is economical of space, but in the case of a heavy flow of traffic is undesirable since it involves the loss of one track as a loading track and also causes interruption to the free use of adjoining berths where quay mechanical appliances may be in the process of handling goods across the tracks to shed. Where possible, each berth and its shed accommodation should be independent for rail working. Although this may mean wider spacing of sheds, the intervening area need not be excessive and is invariably found useful for stacking packages which do not require covered storage, for the assembly of export cargo, and also for use by road vehicles, particularly if the ends, or one end, of each shed can be adapted by means of a platform for road loading. The desirability of providing such open areas near transit sheds is often lost sight of, and their absence may mean unnecessary and wasteful use of covered space (Fig. 1).

If road transport is extensively used on the quay apron, obstruc-

Cargo Handling at Ports—continued

dions should be reduced to the absolute minimum. For this reason, there is much to be said for the use of shunting tractors, instead of capstans, for moving rail wagons. It is difficult to assess the relative overall costs of the two methods, but possibly the use of shunting tractors is the more expensive since they require greater maintenance attention and are unavoidably subjected to much rough usage, especially when quay surfaces are wet and track resistances high owing to dirt or other causes. On the other hand, whilst capstans afford a constant and reliable source of power for such haulage they do form obstructions and call for wider rail spacing if safe clearances are to be ensured; they also have the disadvantage of requiring the use of ropes which, apart from breakages, are often a nuisance and to some extent a danger on busy quays.

Quay surfaces must be smooth and hard wearing, with cross-falls only sufficient to ensure proper drainage. With the advent of mechanised equipment the quality of quay surfaces has greatly increased in importance and must include high strength and wearing characteristics, and it should be a principal requirement that they can be repaired quickly and put into use with the least delay after repair or re-laying. The employment of individual flooring units which can readily be lifted and relevelled or replaced should always receive consideration, since the relatively high initial cost of this system may often be more than repaid by reduction in delays when the quay surface has to be repaired.

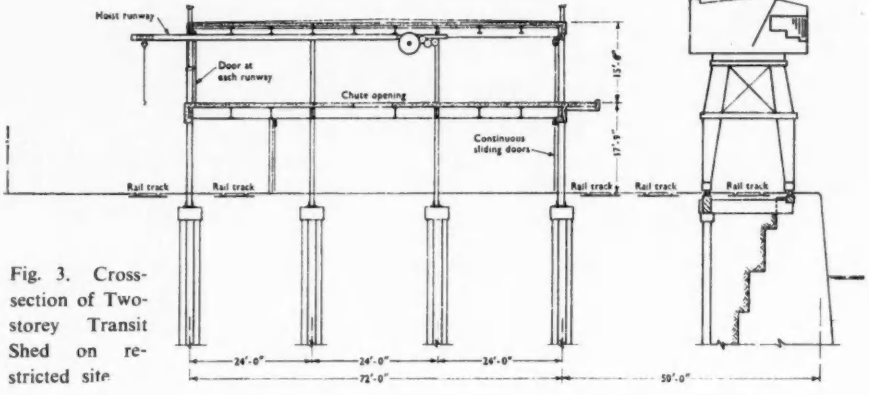


Fig. 3. Cross-section of Two-storey Transit Shed on restricted site

Sheds and Warehouses

The length of any transit shed is generally governed by the length of berth it serves and since the height to which goods can be stacked is largely defined within limits imposed by the type of goods, reasonable floor loadings, the use or otherwise of mechanical equipment, etc., it usually follows that, if the probable volume of traffic which will use any shed is fairly well known, the necessary width can be determined. Should this width be too great for purposes of efficient and economical trucking or unattainable because of space restrictions, then, apart from whether additional accommodation is required for storage of import or export goods, the two-storey or multi-storey shed must be resorted to (Fig. 3).

Whilst on first principles it would seem obvious that single-storey sheds are the most suitable type, there is in fact no general rule which can be laid down in this matter; the problem can only be resolved for each individual case in consultation with all interests concerned and in relation to all local factors. The divergence of opinion evident between many authorities of many countries on the subject of single versus two-storey transit sheds would merely seem to emphasize that, since no two ports are alike either in physical or operating aspects, what has been proved right at one port may prove to be totally wrong at another.

Consistent with fulfilling its proper functions as a safe coverage for goods, a transit shed should be of the lightest and cheapest type possible without incurring heavy and constant expenditure on maintenance. This applies more particularly to the single-storey type, where light construction is more practicable, since if later it is found necessary to provide greater covered area by the erection of a larger shed, or of a two-storey shed, the expenditure involved will be less than required in the alteration or demolition of a heavy-type structure. The use of structural steel in two-storey sheds may well be an advantage, since this method often allows greater possibilities than reinforced concrete for internal alterations to be made should operating experience or changes in traffic require them (Figs. 2 and 3).

Single-storey sheds have the immediate advantage of lower initial cost and greater ease of operation. Possibly the maximum width for normal cargo handling is about 150-ft., although sheds exceeding 200-ft. in width have been constructed and found satisfactory (Fig. 4). Before the advent of efficient mechanical equipment for moving goods at quay level, there might have been objections to shed widths of more than 90-ft. on the score that they would entail excessive trucking. In the case of export cargo having to be handled in shed at the same time as import, single-storey sheds are frequently found unsatisfactory, since the needs of the two cargoes must to some extent conflict, however carefully laid down.

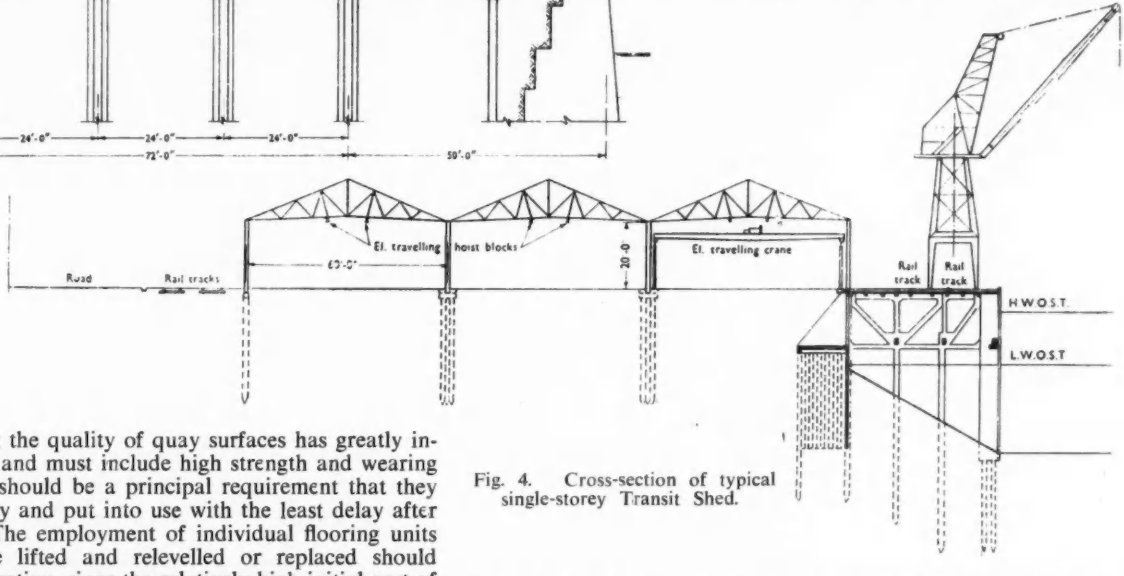


Fig. 4. Cross-section of typical single-storey Transit Shed.

Whilst there are many arguments in favour of the single-storey shed, space is usually so valuable in dock areas that it would often be bad economy to utilize it for single-storey sheds, since the additional initial and operating costs of the two-storey type might well be offset by the availability of space for other import dock works and facilities. Today, more than ever before, there is a growing demand for space (which can ill be spared) on which to provide car parks, medical centres for dock workers, canteens, lavatory and washing facilities, etc. Furthermore, even though a manageable width of 150-ft. or more is available, it may be that the volume of goods to be handled requires greater floor area and so the two-storey shed becomes unavoidable. For transit purposes it is often considered undesirable to exceed two storeys because of the diffi-

Cargo Handling at Ports—continued

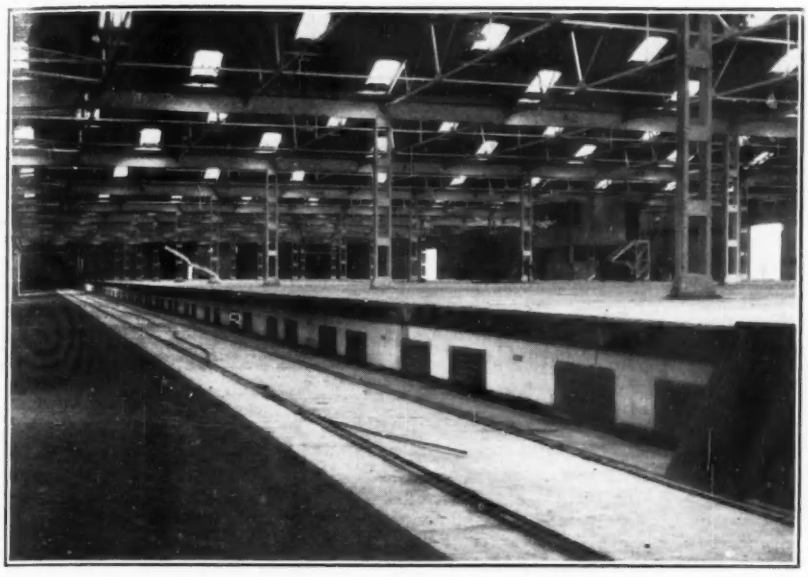


Fig. 5 (above). Interior of General Cargo Warehouse (and Basement Wine Bond) showing column spacing and natural lighting. Fig. 6 (right) Fork-Lift Truck operating on second floor roof of combined Transit Shed and Warehouse—conveying bagged goods to smaller truck for stacking on fourth floor.

culty in arranging that the flow of goods from the various floors can proceed without interruption.

Two-storey sheds almost invariably call for the provision of heavier foundations and in many cases the area has to be piled. This, together with the need for constructing a strong upper floor and installing facilities for deliveries from that floor, greatly increases the cost per square foot of useful floor space. Available figures for the costs of the two types of shed would seem to establish that for equal useful floor areas and generally similar forms of construction a two-storey shed will be approximately 1.60 to 1.80 times the cost of a single-storey shed, allowance being made for the cost of appliances necessary for the delivery of goods landed on the upper floor. The figures of comparative operating costs which are available are insufficient for useful study; but, whilst those for two-storey sheds are certainly higher, there seems little doubt that the skilful management of this type of transit storage can generally show it to be an economic proposition in any overall assessment.

Much has also been said on the subject of shed columns. The advocates of the single-storey building point out the advantages of being able to reduce the number of columns to the absolute minimum, and indeed in many cases being able to dispense with them entirely, thereby leaving large unobstructed floor areas on which mobile plant can operate with complete freedom. But since the construction of large spans, whatever the method employed, will undoubtedly increase the shed cost, it is necessary to consider carefully whether the advantages to be gained are always sufficient to outweigh the greater cost. Absence of floor obstruction is a very commendable objective, but it is surely not imposing an unreasonable restriction if columns are spaced at intervals of, say, not less than 30-ft. Such spacing would generally afford ample room for the operation of mechanical plant, if it is being used with proper care, without really affecting its speed. This does not imply that 30-ft. column spacing is put forward as the maximum in every case; with certain types of cargo it may certainly be both necessary and advantageous to have much wider spacing, but there seems little point in incurring the additional cost if 30-ft. spacing gives an economical design and satisfies other considerations. Present-day methods of construction—prestressed concrete for example—allow the provision of far greater unobstructed floor areas than were formerly possible; these methods, however, should be employed only when it can be demonstrated that a worthwhile gain in speed and a lower cost of handling goods will result. It is doubtful whether this is always kept fully in mind and there is perhaps a tendency for engineers to exhibit advances in technical skill and constructional methods, and for traffic operators to over-emphasize the benefits of these advances, in cases where closer column spacing would be perfectly manageable at less cost. With the stated 30-ft. minimum spacing, the author has found no evidence of real difficulty or loss of shed space or speed in the working of the more usual types of general cargo (Fig. 5).

In the case of two-storey sheds, the upper storey should be stepped back about 12 to 15-ft. on the waterside to provide a continuous platfrom for the handling of goods in the same manner as on the quay (Figs. 2 and 6). Methods of delivery from upper floors must be such that they can adequately handle the type and volume of goods stored. For general cargo, wooden and gravity roller chutes and lifts of 30-cwt. to 2 tons capacity for packages which cannot be handled on chutes are the most common means of delivery. As well as the number of such appliances, it is important to determine their positions in order that deliveries can be effected to road and rail transport inside or outside any shed with the least amount of handling and without impeding work on the ground floor.

Shed floors must be smooth and hard wearing, with no floor slope exceeding 1:100, and the waterside edge should be at quay level to allow the use of mobile equipment from quay into shed. The remarks regarding ease and speed of repair to quay surfaces apply with equal force to shed floors, which ought to be strong enough to allow the free use of fork-lift trucks and similar appliances on upper as well as ground floors (Fig. 6).

For general cargo work a clear height of not less than 16-ft. is required in transit sheds and unless a shed is very narrow, or artificial lighting is to be used at all times, a clear height of 20-ft. would be more desirable. If it is required to use mobile cranes then the height in the sheds, and at some or all doorways, would have to be increased to about 24-ft. so that the cranes may travel with raised jibs. The development of " unit-load " cargoes may have a considerable effect on the heights to be provided, but the figures given would seem to be suitable and difficulties are more likely to arise through insufficient floor strengths to carry the fairly concentrated loadings imposed by such cargoes and the machines which must be employed to stack them.

Despite difficulties of maintenance and in securing watertightness, continuous sliding doors are advantageous, particularly on the

Cargo Handling at Ports—continued

waterside of transit sheds. On busy quays it is a distinct advantage to run trucks or any appliances the shortest possible distance between their point of loading and point of entry into a shed, and this is not possible with only a limited number of shed openings.

Loading platforms at the rear of sheds should be 10 to 12-ft. wide, and any outside platform and the rail track alongside should be under a cover of sufficient extent to shelter road vehicles which may also use the platform (Fig. 1). It is often desirable to arrange for road loading platforms at the ends of sheds, since goods—particularly from upper floors—can at times be more conveniently handled there. A second rail track can be provided at the rear of a two-storey transit shed for direct working of goods by cranes or goods hoists from and to the upper floor. A rather attractive arrangement, whereby handling upper-floor goods can be performed under cover without necessarily interfering with the ground floor working, is to construct a second loading platform, on the rear line of shed columns, served direct by goods lifts. This arrangement also possesses the advantage of allowing, to some extent, simultaneous road and rail working (Fig. 1).

In addition to the usual shed offices, it is becoming increasing necessary to consider allocation of space for the accommodation of mobile plant, pallets, and other gear used in ship work; also special sections for the custody of certain highly pilferable goods. If definite provision is not made for these items shed floors tend to become untidy and obstructed, with increased possibility of accidents, and pilfering and loss of gear may result as well as increased fire risk.

Evenly distributed natural and artificial shed lighting is essential, and in the design of sheds with more than one floor care must be taken to ensure that loss of natural light on the ground and intermediate floors is reduced to the minimum. Interior decoration of sheds can play a large part in the efficiency of both natural and artificial lighting; walls, roofs, and columns should be treated in light colours. Artificial lighting should be designed with the object of giving a reasonably uniform intensity at floor level. Obviously the intensity to be provided will vary with the nature of the work to be done in any shed, but for general work a figure of 1.0/1.50-ft. candle would appear adequate, although in some cases this would have to be greatly increased (say up to 3-ft. candles or more) and the lower figure is perhaps insufficient as an original provision owing to the fairly rapid deterioration in efficiency which will take place (Fig. 5).

Warehouse lighting may vary within very wide limits depending on the goods stored and the methods of operation.

Many of the considerations respecting transit sheds—strength of floors, column spacing, etc.—apply equally to warehouses. It is often advisable to design for greater headroom in warehouses than in transit sheds since, usually, goods can be stacked higher for warehouse than in transit storage. Space occupied by the use of palletized goods may also tend towards the provision of increased clearances.

It is not usually desirable to have warehouse storage superimposed on transit floors. Although such a system possibly affords the most convenient and economical means of warehousing near ship's side, it is too often found that warehouse operations conflict with the working of transit floors. There are, however, certain cases where the arrangement can prove quite workable, such as where short-term storage is made available in the upper floor for goods waiting to be handled to ship, provided that a discharging ship can remain at the berth to load its outward cargo.

Wherever practicable, dock warehouse accommodation should be sited clear of berths and transit sheds; but in addition to adequate road and rail access, the possibility of erecting connecting bridges to the waterside sheds should be considered if the distance between warehouse and berth is not too great. This arrangement si of value when part of the warehouse space is used for export goods which can then be taken to berth for shipment without further need of road or rail transport.

Handling of Port Traffic

By E. S. TOOTH
Superintendent, India and Millwall Docks, Port of London Authority.

General Methods of Mechanical Handling

As, in the interests of speed and economy, port-operating work is becoming more and more mechanized, the task confronting those responsible for it becomes increasingly complex. Further developments in mechanization are inevitable. It is more important than ever before, therefore, that there shall be the closest co-operation between responsible port-operating officials and their engineering opposite numbers.

Since 1945 one of the most important needs has been to turn ships round quickly. Prior to the 1939-45 war, shipowners spent about 40 per cent. of their outlay on ships in port. For various reasons, many of them connected with labour, this figure has increased and is now calculated to be nearer 60 per cent., and not only shipping interests but very often governments are much concerned about it.

In Britain one of the most important factors affecting cargo-handling methods is that both import and export cargoes are so miscellaneous. There are berths which deal with vessels of different lines, bringing a huge variety of goods; there are others catering mainly for ships of the same line or ships engaged in a regular traffic. Even regular traffic may consist of many different types of cargo and the consignments in one vessel can include bales of rubber, chests of tea, bags of rice, pieces of lumber, bundles of canes, military stores, hardwood logs, bags of cotton seed, cases of canned pineapples, and bales of coir fibre and hemp. Stevedoring agents must always be prepared not only to handle such mixed cargoes speedily but also to cope with new packs and new commodities at short notice. Bearing in mind, too, that ships vary a great deal in size and construction, it will be appreciated that the gear and equipment required for port-operating work must be of widely varying types and capacities, and the handling machines must be at least versatile.

The port appliances which first handle imported goods illustrate the latter point. At a modern berth, the quay cranes used for general cargo, i.e., for piece goods, will be speedy on all motions, level luffing, transportable, and self-propelling. In radius and capacity there will be big variations. A radius of 80 to 100-ft. will be necessary, for instance, if there is need to plumb across ships of wide beam or to discharge cargo from vessels berthed against a pontoon to allow barges to be loaded between ship and quay. A long jib will be necessary if it is required to lift goods to a high storey of shore premises. The operator, however, normally prefers the shortest possible jib satisfactory for the work in hand, because he can then see and control his load better. A package swinging on the end of a 100-ft. bond cannot very easily be deposited speedily and safely at a certain spot or in a conveyance. So far as lifting capacity is concerned this, too, will depend upon the type of traffic the crane is expected to handle and will, of course, be controlled by the heaviest probable load.

Consideration of methods of handling goods on quay and in transit sheds leads inevitably to the question of the design of port port premises; this will be dealt with more fully later. For the time being it is sufficient to say that modern quays, transit sheds, and warehouses must be suitable for the new-type machines which are revolutionizing cargo handling throughout the world. The particular appliances in mind are the mobile crane and the fork-lift truck; although straddle carriers, platform trucks, pallet trucks, tractors and trailers, conveyors, stillage, and hand trucks all form part of port-operating equipment, none has the general importance of the mobile crane or the fascinating possibilities of the fork-lift truck.

Mobile Cranes

The mobile crane handling cargo from shed to vehicle and vice versa must, like the quay crane, be to some extent a general-purpose machine, since, as stated, British imports and exports are normally heterogeneous. Some jobs, however, may demand a crane which is to some degree specialized. Handling heavy logs, for example, requires an appliance with a good out-reach so that

Cargo Handling at Ports—continued

the load is unlikely to damage the crane structure. Working under a canopy may require a crane specially designed to reduce the maximum jib height without lessening out-reach.

In the main, however, the operating factors controlling the design of the mobile crane are the same as for the quay crane. The need for a high speed of operation is obvious, for without it receiving from ship will be slowed, deliveries from shed delayed, and the berth will become congested. In addition, the machine must be easy and safe to drive, it must be manœuvrable, and it must be reliable. Its maximum lifting capacity may range between 10 cwt and 10 tons or more, depending upon local requirements. Its jib length varies similarly—normally between 10 and, say, 40-ft. Since operators prefer a compact machine, a crane selected for a particular type of work will not usually have much spare out-reach.

On the question of safety, much attention is necessary to stability. Since (in contrast to the quay crane) the safe working load of the mobile crane varies with the angle of the jib, the driver must exercise much care and always bear in mind that once a package is picked up within the maximum radius of the crane, the jib must not be luffed down beyond the safe position shown on the safe-load indicator. Swinging a load during the slewing operation, working the crane on a sloping surface, and even having tyres of uneven pressure all tend to cause instability and it is necessary from the operating point of view that the safety margin allowed takes these matters into account.

Manœuvrability has been mentioned. Particularly on congested berths good manœuvrability is essential. It can be obtained in more ways than one, e.g., by constructing the crane so that the whole superstructure will slew with the jib round the full circle, or by designing the whole crane to slew, usually by means of the castor action of one or other of the axles. Sometimes there is an operating reason for preferring one method to another.

Manœuvrability requires also the smallest tail-radius consistent with stability and it is important, too, to ensure that the type of tyres fitted to the crane wheels is suitable for the surfaces upon which the machine normally has to work.

How cranes should be powered and whether some should be rail-mounted are also questions which may have different answers at different ports or even at different quays. Petrol-powered machines are sometimes accompanied by a fire risk: diesel-powered machines (either diesel or diesel-electric), like petrol machines, sometimes create difficulty with exhaust fumes when working in confined spaces; steam cranes, which are often rail-mounted (as indeed are diesel cranes) incur stoking costs which are sometimes heavy; electric-mains cranes are not completely mobile; battery-powered machines may slow down or even stop working towards the end of a busy period. Speaking very generally, most port-operating offials may prefer diesel-electric machines on grounds of reliability. They may also be smoother to drive. Very often, however, running costs are the deciding factor.

One last point on mobile cranes is that consideration has to be given to the fact that in the major ports of the United Kingdom most gangs are employed on piecework conditions. As already stated, it is the employer's aim to attain the maximum working speed consistent with safety. A high working speed is also normally the aim of the piecework gang; this is obviously an additional reason why, in designing the mobile crane, careful attention must be given to the margin of safety. It is another reason why cranes for port work must be robust.

Fork-lift Trucks

The introduction of the mobile crane into port-operating work was simplicity itself compared with that of the fork-lift truck, mainly because the former usually displaces little labour. The fork-lift truck called attention to itself because it was so versatile and, when first introduced, was regarded as the panacea for all industrial ills. Although that opinion was quickly proved to be false, there is no doubt that this appliance is becoming invaluable to port operations. At present it is, in fact, the most commonly used handling device. It is employed to lift, convey, stack, turn, invert, and rotate loads and even to pour from containers; although gripping devices have reduced the need for pallets, the introduction of the machine has done much to make port authorities, shipping companies, stevedores, and others pallet conscious.

In the United Kingdom the fork-lift truck was introduced into dock and harbour work on an empirical basis. Employers felt that it would be extremely useful but were not certain in what way, particularly since there was much doubt as to the workpeople's attitude to it. One development in goods handling which was expected was the employment of the "throughout movement method." Had this occurred, it would have demanded the introduction of the fork-lift truck. This method is, of course, the consigning of cargo as unit loads instead of as individual packages. It usually involves the palletizing of goods at production or shipper's premises, so that they can travel as unit loads right through to foreign destination. Port authorities and others, by introducing the fork-lift truck and becoming familiar with its use, were prepared to deal with such traffic. In point of fact, however, except in certain short-sea trades, this method has not yet developed at all.

What has developed is the use of the fork-lift truck with pallets owned by the dock-labour employer and which never leave the

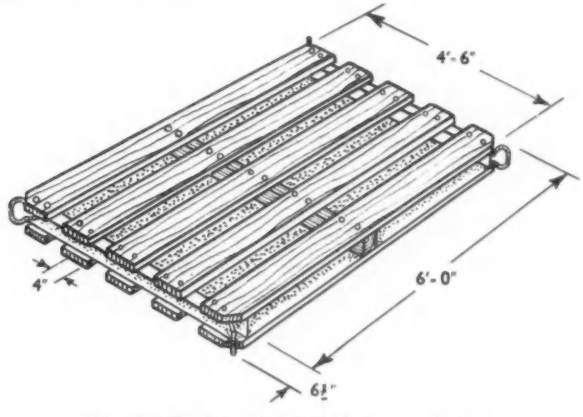


Fig. 7. The Stevedores' Pallet—a dock tool.

berth. These pallets (Fig. 7) are, in fact, dock tools and the latest type has a metal eye at each corner so that it can be lifted aboard by quay crane or ship's derrick as well as conveyed by fork-lift truck.

There is now hardly need to state that a primary reason for introducing the fork-lift truck into port-operating work was to increase working speeds, and since, at the mechanized berths, goods are handled in unit loads of upwards of 1 ton, conveying, piling, warehousing, and delivery are performed much more quickly than by the manual package-by-package method. In fact, where that truck can operate without hindrance, speeds of handling cargo to and from ship and also on quay and in transit shed have often increased by between 20 per cent. and 40 per cent. dead-weight tonnage.

There are, however, other benefits besides speedy working which accrue from the use of the fork-lift truck. For instance, since a standard truck (12-ft. lift) can pile palletized goods up to, say, 16-ft. high, shed capacity is often doubled, despite the need to leave wide working gangways for the machine. At ports where transit-shed space is at a premium, this additional accommodation is a boon. Another benefit is that palletized goods are subject to less damage and less pilferage. This is obvious when it is considered that at a manual export berth each package may have to be man-handled as many as five times between receipt and stowing in hold, whereas at a mechanized berth, the only man-handling is from vehicle to pallet (at shed door) and from pallet to stowage (in ship's hold). The conveying to shed, the piling, the subsequent unpiling (Fig 8), and conveying to ship's side are all done by fork-lift truck at the mechanized berth and there is no need, of course, for the goods to be handled into ship's slings for lifting aboard. They remain on the pallet (Fig. 9).

The operating requirements of the fork-lift truck are therefore similar to those needed in the other machines mentioned. The

Cargo Handling at Ports—continued

[Photo: P.L.A.]
Fig. 8. Conveying palletized exports from Transit Shed to ship's side.

appliance must be speedy in travel, in lifting, and lowering; it must be stable, manœuvrable, reliable, and easy to drive. Operating officials usually want the biggest speeds and lifting capacity without having a clumsy machine. For general work it is certainly necessary to have a 12-ft. lift, a capacity of 2 tons or more (at 24-in. or 27-in. from fork heels), a travelling speed of 8/9 m.p.h., and a lifting speed of, say, 40/50-ft./min. The margin of safety must be a fair one, not only because the goods which pass through ports sometimes have their centres of gravity in unexpected places but also because slopes and uneven ground affect the stability of the machine, particularly when it is loaded. In a factory dealing with packages of standard sizes and weights on level floors, this aspect can be viewed differently, particularly if there is no piecework complication.

Types and sizes of pallets are more varied than those of the machines which carry them. One very important matter from the point of view of shipping interests, however, is that pallets should be big and strong enough to carry an economic load for quay crane or ship's purchase. Hence most " dock-tool " pallets are 48-in./54-in. wide and 64-in./72-in. long and many have a carrying capicity exceeding 3 tons and a stacking capacity of more than 6 tons. The very important question of pallet sizes, however, is at present being dealt with by a technical committee of the International Organisation for Standardisation and it is hoped that when this committee has finished its work and pallets for international trading have been limited to certain sizes, the " throughout movement method " will at last begin to develop between continent and continent. If that occurs, not only will there be fewer types of handling machines required but the variety of types of " slinging " gear should also be substantially reduced.

At the present time hooks, clamps, nets, skips, landing boards, and platforms and many types of rope, chain and wire snorters and slings are in common use with quay, mobile, and other cranes. Unit-load traffic, irrespective of the commodity on the pallets, would all be " slung " by a limited number of types of gear such as a bar-sling, which would fit safely in the pallet wings, or spring-loaded crane forks, which would penetrate between the pallet decks. Whatever the future holds in this sphere, interesting developments are certain.

There are, of course, some cargoes which could not or would not be palletized even in a port where the most advanced methods so far envisaged were employed. Typical examples are bulk sugar, a staple British import, and motor-cars on wheels, one of Britain's most important exports. Cargoes of this kind require special handling equipment, although not necessarily special cranes.

Handling of Sugar

After a great deal of experiment, including the use of suction plant, it has been confirmed that the best means of discharging bulk sugar is by grabs. Although grabbing cranes are preferred, at ports where bulk work is intermittent discharge is often done with ring-discharge or self-dumping grabs on piece cranes. The largest piece cranes likely to be found on berths allocated to general cargo vessels have a lifting capacity of 5 tons. By employing such cranes with suitable self-dumping grabs, outputs of 500 tons per gang per 8-hour day are obtained, at least while there is a good bulk of sugar in the square of the hatch. To maintain high outputs, however, mechanical trimers are necessary in the ship's holds and for this purpose a bucket loader with a capacity of 6 to 8 cwt of sugar per lift has been found to be suitable. This is employed mainly on the ceiling of the ship; in the 'tween decks, light bull-dozers or angle dozers are often used, when the method is to push the sugar into the square of the lower hold, thereby supplementing the work of the bucket loaders.

With this commodity speed of handling is also of vital importance, because the over-riding factor is always to make the ship's stay in port as short as possible. Hence steps are usually taken to enable discharge to proceed on both sides of the vessel simultaneously. Thus, at a quay berth the ship is moored against a pontoon, so that barges may be loaded between ship and quay as well as on the side away from the quay. For work proceeding on that side of the vessel, another special device is often employed. This is a hopper fitted with a spring mattress (for self-dumping grab) and two long outlets. This appliance is placed on the deck on the " outside " of the ship and all the crane has to do is to lift the loaded grab from the hold and lower it on to the mattress of the hopper. This halves the distance of the luffing motion, it obviates slewing, and the crane driver can work more quickly because, for most of the operation, he does not have to rely upon another man's signals.

Handling Motor-Cars

Motor-cars on wheels sent to port for export do not require any special handling machines but they do require special lifting gear. they are usually driven to the berth or are brought on special carriers, from which they are run to ground level. When a car is re-

[Photo: P.L.A.]
Fig. 9. Loaded Stevedores' Pallet being lifted aboard export vessel.

Cargo Handling at Ports—continued

quired alongside a ship, it is often towed from the parking ground by a fork-lift truck, which finally pulls it over the motor-car lifting gear, which has been placed in readiness on the quay alongside the hatch concerned. Gear of this kind often consists either of a pair of oblong nets or of a pair of sets of slats which, when tightened by lifting, takes the weight of the car on the treads of the wheels. Some stevedores prefer a type of gear which consists of four metal-wheel scissor-grips. Whatever equipment is used, however, the rope or wire legs supporting it are held away from the car body by means of spreaders.

Even for car-handling, however, the fork-lift truck has been employed as a piling machine. At one European port, where parking space is scarce, tubular scaffolding "shelves" have been erected and experiments made with a 16,000 lb. fork-lift truck, fitted with very long forks, which placed cars three high, each car resting on its own shelf. There is no doubt that the versatility of the fork-lift truck has not yet been fully exploited.

The Design of Premises

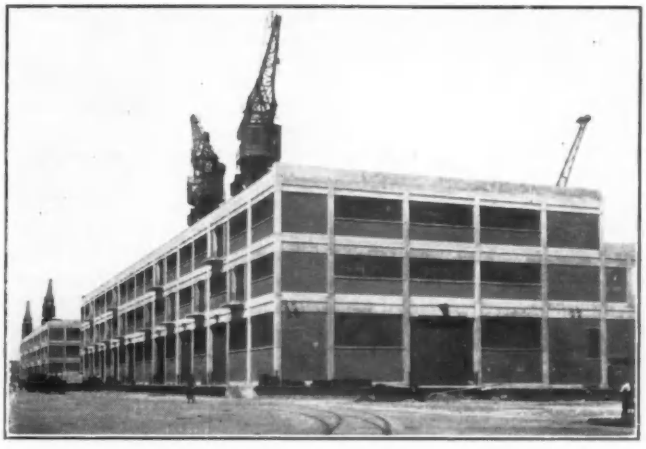
It will now be appropriate to examine how the introduction of new cargo-handling methods is affecting the design of port premises. For a very long time it was the practice to construct one transit shed per berth and as ships increased in size sheds also became larger. However, whilst most jobs were done manually, perhaps with the use of two and four-wheeled trucks, or were at most mechanized by the employment of conveyors or powered platform trucks, little alteration was necessary in shed design.

After the second world war the position changed. The need to use mobile cranes and fork-lift trucks with dock pallets has called for a new overall approach and berths are now being constructed on a new pattern. Primarily they must have ample working space for the machines, not only inside the shed but also outside. This is provided by adequate cart areas and approach roads, wide quays, wide and high doorways and also, inside the shed, the minimum number of supporting columns, with plenty of room to work upwards. All working surfaces are smooth, level, and hard-wearing and the shed has good natural and artificial lighting. This is important since goods have to be piled high and meticulously.

Two berths embodying these principles have recently been built by the Port of London Authority at their West India Dock to accommodate ocean-going vessels up to 500-ft. or more in length. The quay is 50-ft. wide and is equipped with two sets of standard-gauge rail tracks and with 3-ton portal cranes of the crank-operated level-luffing type, electrically driven on all motions, including travelling. Each shed consists of three storeys, ground and first floors being transit accommodation, the top floor providing about 4,000 tons of warehousing space. On the quay side, the first and second floors are each set back 15-ft. leaving wide verandahs which can be plumbed by the 65-ft. and 80-ft. radius quay cranes. The ground floor measures 432-ft. x 128-ft. x 24-ft. 6-in. high. Doorways are 22-ft. wide x 20-ft. high. The height of each of the upper floors is 16-ft. 6-in.

[Photo: P.L.A.]

Fig. 10. Ground Floor of the Shed at one berth.



[Photo: P.L.A.]

Fig. 11. Balconies and Roof Cranes at the rear of the Sheds.

The smooth hardwearing floors (Fig. 10) of reinforced concrete have proved satisfactory for mobile cranes and fork-lift trucks. Fork trucks of 3-tons capacity work on all floors; on the top floor they pile, among other goods, reels of liner board weighing up to 4,500 lb. each.

At the rear of the shed the staggered balconies (Fig. 11) are large enough for easy negotiating by loaded fork-lift truck. These balconies, the ground floor doorways, and the rail tracks alongside, are served by travelling roof cranes of 30-cwt capacity. The spacious cart area between the sheds has proved invaluable. It is 230-ft. long and extends about 200-ft. back from the quay edge. Appropriate attention has also been paid to lighting and there is no doubt that the shed design is not only completely satisfactory now but that it is likely to remain so at least until even more revolutionary handling machinery is invented.

It may be useful to conclude by following some hypothetical consignments of imports from quay into and then out of the transit shed at a mechanized berth. The cargo (except bagged goods) will probably be lifted ashore on the large pallets already described. These loaded pallets will be picked up from the quay at the ship's side by fork-lift truck and taken into the transit shed either to piling ground or to sorting pitch. The goods for direct piling will be stacked by the conveying truck but mixed pallet loads will be sorted elsewhere on to fresh pallets for subsequent piling. Since valuable, pilferable, and bonded goods often have to be placed in "lock-up" accommodation these "cages," too, are constructed to allow access by the new machines.

Some goods, e.g., large casks, battened cases, and reels of paper can be handled by fork-lift truck without the use of pallets. Others —particularly bagged goods—are handled in rope slings. Sling-loads are conveyed into the shed by platform truck and then lifted to pile (sometimes twenty-five bags or more high) by mobile crane or belt-conveyor.

Since, as already stated, the transit shed must be cleared without delay to make room for the cargo from the next ship, goods not for immediate delivery have to be warehoused. Whatever operation is required, however, it will normally be performed by one of the machines mentioned. The bags will be conveyed by platform truck (if the vehicle cannot get alongside the pile), the unit loads by fork truck. This machine will place a load on the tail-board of a lorry or the floor of a railway wagon and go about other work while the goods are being stowed from pallet to vehicle. The fork-lift truck will also deliver the pallet load under plumb of a mobile, quay, wall, or roof crane for delivery to barge or into warehouse. At all interim handlings these goods remain in unit-load form; only when they are finally passing out of the custody of the port organisation are the loads broken down and the packages handled separately. Even that is not always necessary, however, for at

Cargo Handling at Ports—continued

isolated places the practice has already begun for dock-owned pallets to go to consignee for unloading.

Future Trends

It is true to say, of course, that the mechanized methods described are so far being fully employed only at certain pioneer berths. Nevertheless, the modern trend is now clear. For piece goods, it is unit-load handling instead of individual package handling—to effect savings in time, space, money, and arduous labour. The evolution of this method is already far enough advanced to affect not only the types of port equipment required and the layout of quays, sheds, and warehouses but also, in the general industrial world, goods-packaging, transport-vehicle design, and the pattern of factory and other premises. There is little doubt that it will ultimately affect ship construction.

In maritime countries, speed of ship discharging and loading with care of cargo and safety of personnel, is essential to the national economy and, although existing kinds of equipment are being improved daily, it is from the new-type appliances that the more dramatic benefits are expected. When these accrue, the recipients will not only be the port employers and the shipping companies, they will include manufacturers, shippers, receivers, haulage and lighterage contractors, many groups of work-people and, it is hoped, the consumer.

The Supply and Maintenance of Mechanical Equipment

By J. C. SHIRE, A.M.I.Mech.E., A.M.I.N.A.
(Divisional Engineer (Mechanical), Port of London Authority).

The Supply and Selection of Equipment

The design and manufacture of handling plant has of necessity become a highly specialized industry. The dock engineer cannot hope to be a specialist in these fields, and he has therefore, when purchasing equipment, to utilise the knowledge and technique which the manufacturers have applied in the production of their ranges of standard equipment.

In considering the problem of equipment for cargo handling, the first and obvious essential is to ascertain clearly from the operating departments concerning their basic requirements. Since the cost of manufacturing specially designed equipment is invariably high in comparison with that in standard production, it devolves upon the engineer wherever possible to consider these requirements against the background that they can usually be met from normal production channels.

Any machine considered for dock work should be structually, mechanically, and electrically of robust construction, so designed that maintenance is easy and cheap, economical in operation, easy to drive, so far as possible standard with existing equipment, and built to the requirements of the Factories Acts, docks regulations, other applicable statutes, and the relevant B.S. specification. The machine should be of the most suitable type for the work which it is required to do (i.e., it is not satisfactory to use a fork truck, where a mobile crane would be better). Considerable thought should be given to both maintenance and economy of operation, since there are costs which recur throughout the life of the plant, and the selected machines should be compared under all the above headings.

When a standard production unit does not meet all the requirements, the necessary modifications will have to be specified. It has been the author's experience that standard plant, occasionally incorporating minor modifications, is generally suited to dock work, and is therefore proposed to deal bfiefly with a few of these modifications, which may be of interest to other users of mechanical plant.

Modifications to standard production equipment

The principal and most costly item of equipment for handling general cargo is the quay crane. Crank-luffing electric D.C. portal quay cranes have a proved reliability and will give 20 years' service without a major overhaul. To reduce maintenance costs and to improve the driver's control of the crane and his range of vision, certain modifications to the equipment normally fitted have been specified for future cranes of this type.

The existing cranes have drum-type controllers (Fig. 12) on all motions with contactor panels for luff and hoist. Recent tests using contactor panels on all three motions and " joystick " type combined master controller for luff and slew and a similar type controller for the hoist motion have been tried and found to meet with the driver's approval (Figs. 13 and 14). Drum-controller

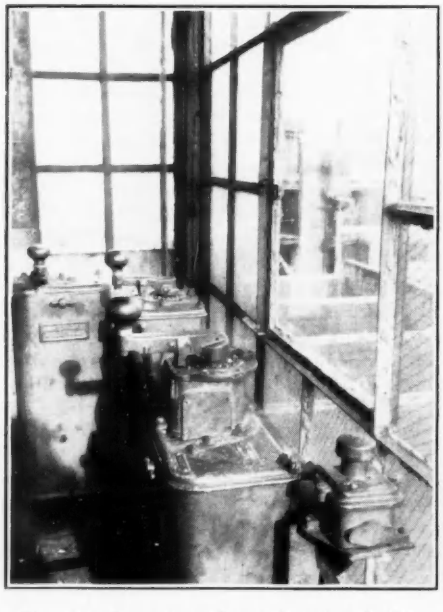


Fig. 12. Drum-type Controllers installed in Crank Luffing Quay Crane.

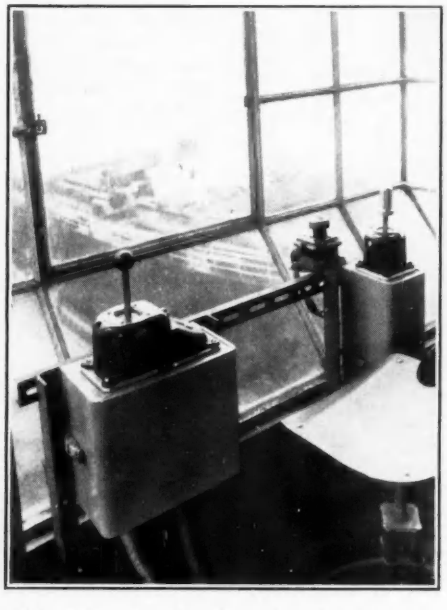


Fig. 13. Joystick Controller installed in Crank Luffing Quay Crane.

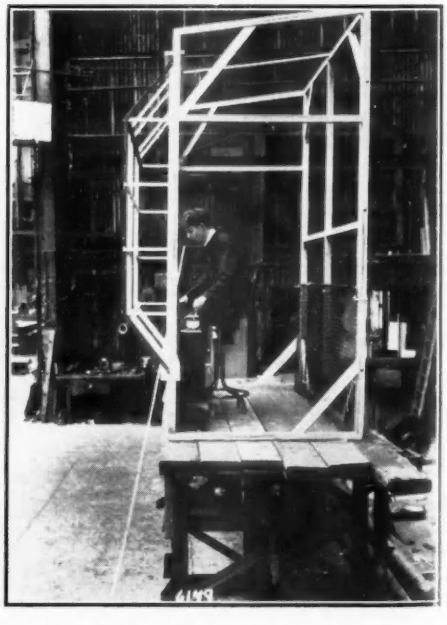


Fig. 14. Mock-up of Bow-fronted Cab and "Joystick" Controllers for Crank Luffing Quay Cranes.

Cargo Handling at Ports—continued

repairs constitute a major item of electric crane maintenance and it is expected that these modifications will reduce maintenance work to the occasional renewal of contact tips. The rating of the slew-and-hoist control resistances is being increased from 5 to 10 min., and additional ventilation is being provided since it has been found that under certain conditions overheating of resistances occurs. The wiring is being improved by replacing V.I.R. insulation with poly-chloroprene, and fitting fibre-glass sleeving to all tails connected to resistances. To improve visibility from the cab, a bow front is being fitted. The cost of these modifications is £330.

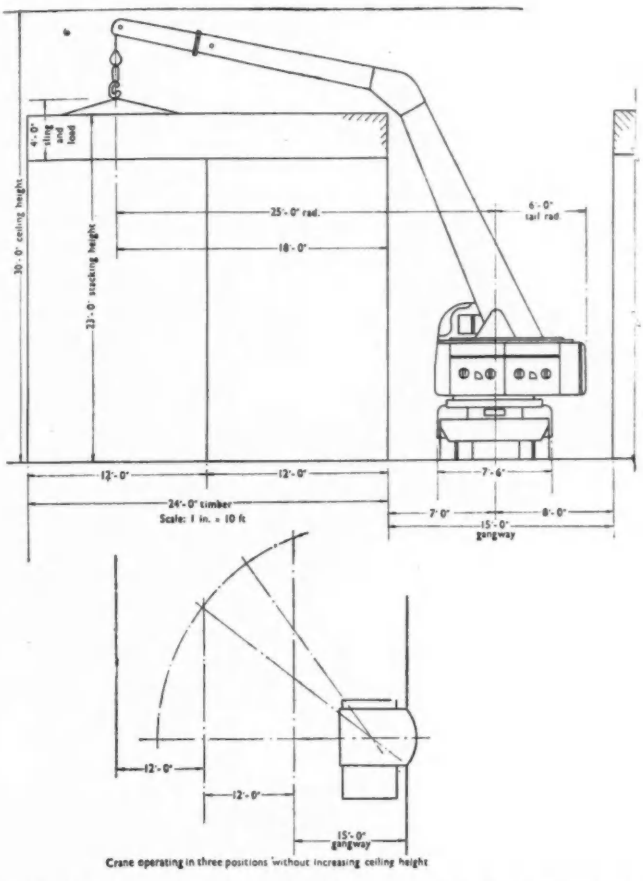


Fig. 15. Mobile Crane fitted with 26-ft. swan neck jib and 6-ft. bolted extension handling timber.

Crane duties:— 2 tons at 15-ft. 6-in. rad. Height of lift 32-ft.
1½ tons at 20-ft. 0-in. rad. Height of lift 29-ft.
1 ton at 26-ft. 0-in. rad. Height of lift 22-ft.
Turning circle 20-ft. 0-in.

To obviate the potential corrosion points, which exist at the screwed connections of the handrailing, tubular dowel-joint type of rail will be used; this will not increase the price of the cranes.

The fitting of tubular jibs of triangular or box construction will reduce the weight of jib and flyweight by about 6 tons, lessen windage, improve appearance, and effect a saving in cost of £160.

In recent years much has been published on the treatment and painting of iron and steelwork to prevent corrosion and minimize painting expenses. In general, preparation by shot blasting or pickling has been recommended. The cost of shot blasting is £500 and £675 for 3-ton and 5-ton cranes respectively. Since cranes now 15 years old are only just being repainted, at a cost of £320, shot blasting appears to be uneconomical at present prices.

The mobile crane is an important item of equipment for cargo handling, and in the author's experience, the standard types have the essential features for withstanding the heavy duty of dock working. The average annual maintenance costs range from £195 to £230 per crane of 3 to 5 tons capacity. Only minor modifications have generally been considered desirable, e.g., the fitting of tyre restrictor rings, metallic tyres, four-wheel brakes, upturned exhaust pipes, and additional guarding. It is not considered that there is any special engineering advantage to be gained from the use of diesel-electric instead of diesel-mechanical cranes. The capital, operating, and maintenance costs of the two types are comparable.

For economy of operation the cranes must have diesel not petrol engines. The cost of £1,200 for a recent conversion of two 5-ton petrol-electric cranes to diesel-electric will be saved in less than 5 years by reduced fuel costs even when working only single shift, 5½ days a week.

One instance where modification of a standard machine in more than details was found necessary illustrates what can be achieved while still utilizing normal production machines.The requirements were for a mobile crane to handle and stack sawn timber, working partially on soft ground: it had to be capable of plumbing the outside of a barge (20-ft. out-reach), of stacking 12-ft. lengths of timber to a height of 23-ft., two lengths deep under a shed with 30-ft. free height, leaving only 15-ft. gangways. Fig. 15 illustrates the arrangements and the special jib designed to fit a standard diesel-electric crane. For working on the soft ground, power steering and larger travel motor and generator were specified. To give protection from swinging loads, ¼-in. steel cladding was fitted on to the front of the cab and underside of the jib, ladder-type protection at the front and top of the cab, and heavy rubber buffers on the corners of the superstructure. Air brakes were specified as an extra precaution in addition to the minor modifications mentioned.

Fig. 16. Extension carriage and forks fitted to fluid-drive Fork-lift Truck for handling liner board.

The latest addition in the cargo-handling field is the fork-lift truck. Experience has shown that the leading makes of diesel-powered truck requires few modifications to make them into satisfactory dock operating tools. In the Authority's docks a standard production truck with the normal type of clutch and transmission has been in use for some years. Eighteen months ago six trucks fitted with torque-convertor drive were introduced. Whilst this type of drive because of its efficiency characteristics increases fuel consumption (at a cost of £20 per annum), it is preferred to the dry plate clutch since it obviates many transmission troubles occasioned by heavy handling, and has thereby reduced maintenance costs. In addition, the fluid drive has controls similar to those of the battery truck, and minimizes driver fatigue. These trucks have been fitted with a leading motor manufacturerer's diesel engine as an alternative to the more expensive and powerful four-cylinder petrol engine normally used, and have behaved splendidly under the arduous conditions to which they are subjected. One development of the fluid drive, a 3-ton truck at 27-in. was the design of a side-extension carriage and long forks to facili-

Cargo Handling at Ports—continued

tate the handling and stacking of reels of liner board. The extension was necessary to allow for insertion and withdrawal of the forks when stacking, because the original carriage width coincided with the pressure points between reels, and the long forks because the centre of gravity of the 80-in. reels was too near the end of the standard 48-in. forks for satisfactory support (Fig. 16).

The relative annual costs of operating battery, diesel, and petrol-powered fork trucks of similar capacity are in the ratio of 4:5:8. The actual cost for the 2-ton battery truck is about £400, including maintenance, battery charging, depreciation, and the provision of one spare battery to three trucks. Apart from the economic advantage of the battery truck, it is easier to maintain, has no obnoxious exhaust fumes, is silent, and easy to drive. Its disadvantages at present are: (a) battery-charging facilities have to be available,

Fig. 17. Roof Transporter and Crank Luffing Roof Crane.

which may necessitate long-distance travelling by the trucks or carriage of the batteries, and may make transfer of trucks to outlying areas difficult; (b) with the present available design of battery it is not possible with the larger-capacity trucks to achieve a full working day without battery change and; (c) the operating speeds of the battery trucks are usually rather less than those of the diesel. Whilst it is relatively easy to increase the speeds, this further reduces the battery working hours between charging.

These disadvantages are not insuperable and when they have been overcome, the diesel truck and other diesel-powered appliances may well tend to be superseded in the same way as petrol has been ousted by diesel. The changeover to battery operation would be a natural outcome of the generation of electric power by atomic methods, and it may even be possible within the next decade to harness the atom directly to the handling appliance and dispense with the battery.

Conditions arise where standard equipment cannt be satisfactorily used. In one recent case, additional cranage was required to supplmenet existing 30-cwt crank luffing roof cranes operating on the road side of three-storey sheds, which have staggered loop-holes on the first and second floors. The men working cargo from the flaps inclined to keep inside the shed, which resulted in the driver's visibility of his hook being restricted. The cost of the roof cranes was £8,000 each; this was considered high in relation to the revenue which could be expected from their installation.

A roof transporter incorporating standard components (gear boxes, electrical equipment, etc.) was designed. It has the same operating characteristics as the crane, but is controlled from a pendant push-button panel, which is retractable for positioning at either level of loop-holes. (Figs. 17 and 18.) The machine cost £5,000 and is preferred to the crane by the operators. The origina specification and design called for speeds of:

Hoisting	two speeds	100-ft./min
Lowering		20 „
Carriage travel in	two speeds	100 „
Carriage travel out		20 „
Long travel		40 „

When tested the higher carriage-travel speed caused excessive swinging of the load, and it was found possible to inch, on hoist or lower, without using the low speed. The control was modified to cut out these speeds, and the simplified control panel has only

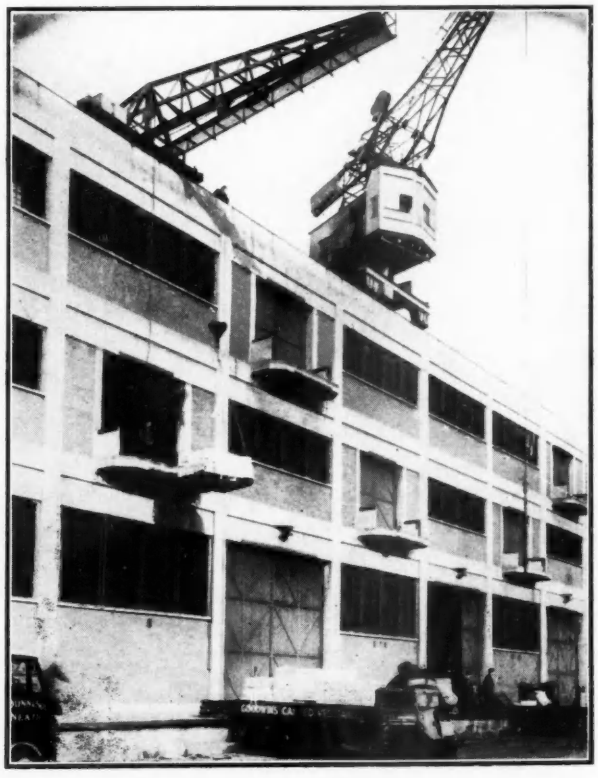


Fig. 18. Roof Transporter with Pendant Control Panel and Crank Luffing Roof Crane.

eight buttons instead of the original twelve, which makes driving very simple.

It is frequently necessary to discharge bulk cargoes by using dumping grabs on piece-work cranes. The Authority in this respect is concerned mainly with handling bulk sugar out of general cargo ships and uses 81/65 cu. ft. twin-chain, coal-type grabs on 5-ton cranes. A grab has recently been designed specifically for ship-discharge work (Fig. 19); it has a lower centre of gravity to prevent tipping when dumped, heavy shrouding to obviate catching under coamings and damage to grab and ship, and wire-rope operation to facilitate block fall. This grab has been extensively tested and has given an improvement of about 25 per cent. in output per cubic foot of nominal capacity compared with the standard coal type.

Unfortunately its dead-weight is greater than that of the coal-type grab, owing to the heavy shrouding and construction, and only a 70/56 cu ft. grab could be accommodated within the capacity of the cranes, which are limited to 4 tons when grabbing, under B.S. 2452. About 17 per cent. of the Authority's costs for handling sugar, including overheads, results from ship, grab, and crane damages, and since output is only 45/50 tons per hour per crane, it was

Cargo Handling at Ports—continued

considered desirable to effect improvements, and in consultation with the manufacturers a new type of grab has been designed with aluminium buckets. As a result, the weight has been decreased by 6 cwt., and the nominal capacity increased to 81/65 cu. ft. It is anticipated that with this grab present output could be improved by at least 15 tons per hour and damage costs materially decreased.

The relative costs of the grabs are:

81/65 cu. ft. twin-chain coal type	£630
70/56 cu. ft. wire-rope ship grab	£680
81/65 cu. ft. wire-rope ship grab (with aluminium buckets)	£970

The author is of the opinion that where piece-work cranes are likely to be used for more than occasional grabbing duties, they should be designed to the class 3 specifications under B.S. 2452.

Fig. 19. Prototype Wire-rope Dumping Grab for ship discharge (shown here dumping sugar).

Mr. Shire then went on to deal with the maintenance of mobile cargo-handling equipment and described a scheme for the maintenance of the following: Fifty-five mobile cranes; thirty-six fork-lift trucks; thirty-four vehicles; sixteen tractors; eighteen trailers; and numerous ancillary equipment.

From an analysis of the maintenance and repair operations involved he assessed the manpower required as eleven fitters, twelve mates, two electricians, eight oilers and two painters, together with supervisory and clerical staff. He described the type of workshop premises and listed the equipment required.

The Design of Ships from the Cargo Handling Point of View

By J. A. H. LEES, B.Sc., M.I.N.A.

Mr. Lees considered certain principles in the design of a ship, taking as a basis the single-screw 15-knot cargo liner which was designed and built as a standard ship under the auspices of the Ministry of War Transport during the latter stages of the 1939-45 war.

He dealt with certain features, account of which must be taken when considering the cargo arrangements for any ship which is to be employed on long international voyages, viz.: passenger accommodation; the need for and positioning of transverse watertight bulkheads; draught; the spacing and number of decks; the positioning of pillars; hatches and covers; masts, derricks and winches; deck cargo; stability, trim and strength, main propelling machinery and bunker arrangements; and other constructional details.

The remaining sections of his paper are given in full.

Cargo Handling

The precise practice varies from port to port and the commodity being handled. It is outside the province of this Paper to discuss the shore aspect but it may be convenient, when considering cargo handling on board, to review the usual procedure for handling general cargo.

Outward cargo is unloaded from road and rail transport, recorded, and laid out in the receiving shed in the port order in which it is to be shipped. It is then measured and port marked and is available for Customs' examination where required. Average mixed cargo is placed in " net-boards " on low platforms (skids) ready for moving by low-lift electric trucks to the appropriate hatch position alongside the vessel. Heavier or bulkier cargo is dealt with in a similar manner except that wire or rope slings are used in place of boards.

The percentage of the whole cargo which can be dealt with as above in the receiving shed so that loading may start as soon as the vessel comes alongside the loading berth, and continue without interruption, will depend on the size of the shed and the shore organization. If a vessel is to be fully loaded at one berth it may be necessary to fill and empty the receiving shed several times.

The lifts are handled from the quayside to the square of the hatch by the normal type of shore luffing cranes of capacity varying from 2 to 6 tons, or by the ship's derrick gear usually working on some " burtoning " arrangement for lifting and swinging. The average lift is about 2 tons, and the items are tallied on board.

According to conditions, one or more gangs of stevedores per hatch may be employed on board. A variety of improvised and seemingly primitive manual means are used by them to transfer the components from the hatch square to their allotted stowage space and the net-board or sling is returned for recharging. Shore labour is adjusted as necessary to suit the number of gangs employed on board.

Dunnage for the separation, protection, and ventilation of the different parcels of cargo is worked in by the stevedores as loading progresses and certain items, because of their weight or nature, may require special shoring, lashing, chocking, or positioning. Certain classes of cargo, i.e., explosives, inflammable, or poisonous, require special stowage and may not be permitted in a passenger ship.

Finally, the stevedores ship the hatch beams and covers and the ship's crew secure the tarpaulins and locking bars

During the loading process the Shipowner's Cargo Superintendent is kept advised regarding non or late arrivals of consignments and the scheme of loading is adjusted accordingly.

The discharging operation is generally similar but in reverse order to that described for loading. Portable lengths of gravity rollers may be used to assist in the transference of cased goods within the cargo space to the hatch square.

With general miscellaneous cargo it is impracticable to completely fill all the available volume within any cargo space; the lost space will depend on the design of the ship, the type of cargo, and whether the cargo is well stored or otherwise. For example, in a vessel having insulated chambers designed for the most efficient stowage of fruit or meat homewards, about half the available space therein may be lost if motor vehicles are loaded outward.

Neglecting the space occupied by the refrigerating machinery, about 17-20 per cent. of the available space is taken up by insulation, air cooling batteries, and cooled air distributing trunks, which are sited within the boundary structure of insulated compartments.

General Observations

The problem of cargo handling is not simply one of design of ship and/or port.

Experience at certain ports and loading berths has shown that general cargo and bulk cargo can be loaded and discharged into and from the conventional type of ship at speeds which are princi-

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Book Reviews

Proceedings of the First Conference on Coastal Engineering Instruments, Berkeley, California, October 31—November 2, 1955. Edited by R. L. Wiegel. Published by the Council on Wave Research, The Engineering Foundation, 302 pp.

This is a symposium based on the proceedings of the first conference on engineering instruments held at Berkeley, California, October 31 to November 2, 1955. Most of the articles are by American authors but there are a few contributions from Great Britain, by members of the staff of the National Institute of Oceanography and the Hydraulics Research Organization. The main emphasis is on the subject of surface sea waves, twenty-one of the twenty-eight articles dealing with this subject in some form or another. The first chapter is a very interesting article by C. Cox about the estimation of sea surface roughness from sun glitter patterns as obtained from aerial photography (or perhaps aerial photometry would be a better description). This technique has already been used very successfully by the author in conjunction with W. Munk.

The next ten chapters deal with wave measuring instruments and then come two chapters on wave analysis, one of them by M. J. Tucker describing the wave analyser which has been used at the National Institute of Oceanography since 1944. The following ten chapters deal with instruments which measure the force due to the waves, including the force on mooring cables, shock pressure and hydrodynamic impact. The next four chapters deal with instruments for measuring sea currents, although one of them describes an instrument for measuring the orbital velocity of waves and so really belongs to the wave section. The remaining chapters deal with temperature-salinity meters, free diving as an aid to coastal engineering, a deep water instrument station and finally a list of papers on instruments submitted at earlier conferences on coastal engineering.

The reviewer was personally more interested in the sections dealing with the measurement and analysis of waves. The instruments described also include those designed for use with model tanks in the laboratory and a very comprehensive article on these type of instruments is given by M. J. Wilkie of the Hydraulic Research Station. Wave measuring instruments can be divided into two classes, those that actually measure the surface elevation and those that measure the pressure due to the waves at a depth below the surface. The surface recorders described are mainly all developments of well known designs such as the parallel wire resistance wave meter and the step resistance wave meter where the water surface short circuits an electrical circuit. A newer development of this idea is the capacitance wave meter where the capacity between two wires partly submerged is measured instead of the resistance to give the wave height. Another form of this instrument described has been used very successfully by the National Institute of Oceanography at Staines Reservoir.

The ship-borne wave recorder described by M. J. Tucker combines between the surface and pressure recorders as it is virtually a surface recorder but it still depends partly on a pressure measuring instrument placed in the ship's hull 10-ft. below the surface as well as on an accelerometer the output of which is doubly integrated. The pressure recorders are also largely developments of well known ideas. The Mark IX shore wave recorder described by F. E. Snodgrass seems to be very similar in principle to an instrument manufactured by the Cambridge Instrument Company several years ago, but the newer version has the advantage that the output can be fed directly into a standard pen recorder. The thermopile wave meter has not been used in this country as far as the reviewer is aware. It is a pressure recorder, the change of pressure causing a change in temperature in a submerged rubber bellows filled with air. The difference between the temperature of the air in the bellows and that of the sea outside is measured by a thermopile. There is no mention in the symposium of any wave pressure recorders based on the piezo-electric effect, although instruments of this type, using quartz slabs, have been used in this country for years. A shock pressure meter using this principle is described, however.

It seems remarkable to the reviewer that with all the improvement that has been obtained in measuring surface height and wave pressure, the theoretical relationship between the two has not yet been checekd experimentally in a satisfactory manner. Some work in this direction will be carried out soon in this country, using a piezo-electric wave pressure recorder and a capacitance surface wave recorder.

The article on the U.S. Navy's development of recording and analysing equipment by V. J. Covello and A. G. Alexiou should be mentioned as it describes trials in measuring waves with a very sensitive radio altimeter used from an aircraft. This instrument was developed in Great Britain and the reviewer was able to use results taken by the prototype in 1949. Its use in America has not hitherto been successful and substantial modifications are suggested in the article.

The sections dealing with measuring current are very interesting. Among the many more complicated instruments, it is rather refreshing to find a very simple one in the current meter and wire angle gauge described by Dr. J. N. Carruthers. The wire angle gauge of a tow line is determined by a pendulum actuated inclinometer, the position of this at the time of measurment being "frozen" by the setting of a gelatine solution in which all the measuring parts are enclosed. This instrument has been designed mainly for use by fishermen and crews of lightships and it will no doubt find a widespread use in this connection. It is to be regretted there is no description of current measuring instruments which are based on the e.m.f. set up when a conducting liquid flows past two electrodes situated in a magnetic field (either the Earth's field or an artifically produced field). This method of measurement was first suggested by Faraday and has in one form or another been used very successfully in this country in recent years.

In conclusion, the reviewer found the symposium a very interesting volume to read and thoroughly recommends it to all who are interested in the subject.

J.D.

The Library and the Picture Collection of the Port of London Authority. By Bertram Stewart, A.C.I.S. Published by The Richards Press Ltd. Price 25/-.

This publication, which has been compiled by the librarian to the Authority, provides a survey of the archives, books and pictures preserved by the Port of London Authority and their predecessors.

The volume is in two parts, the first being devoted to the books, prints and current records of the Library and the second to the paintings, portraits and engravings in the Authority's collection. There are 39 illustrations which have been reproduced from the original oil paintings and water colours.

This book should be of great interest to readers concerned with the administration, mercantile history and topography of the Port of London.

Cargo Handling at Ports—*continued*

pally governed by the port facilities and organization, and the land transport system. Assuming that these factors cannot be materially improved, the most fruitful line of research might be to investigate possible ways of reducing handling charges.

It is only rational to mechanize if the machines (with their attendant overhead expenses) can do the work more cheaply than by manual labour.

From the ship-design aspect, it may be uneconomic to fit elaborate and expensive mechanical gear which would only be used intermittently and probably prejudice the earning potential of the vessel.

It might be imagined that it would be cheapest to deal with cased fruit, and other small items of uniformly packed general cargo, by shore elevator and conveyor gear similar in prinicple to that used for handling bananas.

It appears at this stage that fundamental change is unlikely in the design of ships for the carriage of general cargo on liner service.

For new bulk trades and new ports, the premises mentioned earlier on do not wholly apply. A more stable pattern for the world movement of bulk cargoes is perhaps emerging and, should the trend continue, it seems probable that ports will be called upon to provde facilities for new types of ships which will be designed for fully mechanized cargo handling.

Flags of Convenience

The Impact of a Growing Practice on British Shipping

By a Special Correspondent

A new threat is enveloping the British Merchant Navy, and indeed the merchant fleets of other countries also. Even the ordinary individual is getting to know what the phrase "flags of convenience" means—the registration of ships in countries which have no pretensions to be maritime states. " Flags of advantage," " Flags of easy virtue," " Runaway flags "—these are a few of the terms of contempt which are being used to describe the method by which the shipowners of some foreign countries are able to avoid the tax liabilities in their own countries by flying the ensigns of those which offer the inducement of tax-free, or virtually tax-free conditions.

The subject is one that demands serious, and objective consideration. First, what do the shipping organisations think of flags of convenience? Says the Chamber of Shipping of the United Kingdom " it is a device which enables individual shipowners to use what are in effect international registry offices to obtain advantages, or to escape from obligations inherent in the flying of the flag of their own country."

The Chamber goes on to analyse the position as follows:—

" In the post-war period, the mushroom growth of flags of convenience is probably the most startling phenomenon in international shipping. In 1939, the combined fleets of Panama, Liberia, Honduras and Costa Rica totalled some 750,000 gross tons. The tonnage of Liberia and Costa Rica was so small as not even to warrant specific mention in the statistical tables of world tonnage. By December, 1955, the total tonnage had increased to 9,250,000, of which nearly 5,000,000 was tanker tonnage.

" What lies behind this form of ' escapism ' and why do the shipowners of some nations and not of others resort to it? The mere act of registration under these flags of convenience is open to all. There are as few formalities as at Reno. In Liberia, for example—now the largest of the new ' maritime ' powers—any foreigner can register his ship without any real question of domicile, or, in the case of a company, even of its seat of management. There are no qualifications required as in the case of shipowners seeking registry in the United Kingdom where registration is strictly limited to British subjects, or British-registered companies, having their principal place of business ' in some part of Her Majesty's Dominions.'

" In the past, foreign shipowners found it convenient to register their ships in countries other than those of domicile for various reasons. For example, during the prohibition era in America, two American-owned passenger ships were transferred to Panama registry to avoid the inconveniences that era entailed. Some twenty years later, one of the big American companies transferred almost its entire tanker fleet to foreign registry during the operation of the American Neutrality Act so that the ships could go to the war zones.

" To-day, the advantages to be obtained from registering under Panama, Liberia, Honduras or Costa Rica, are essentially financial. To be able to exchange a heavy burden of taxation for what is, in effect, no burden at all, is an advantage too obvious to require elaboration. The result is that shipowners who are free to do so have available to them a most convenient and profitable method of solving their replacement problems, and so a means of increasing the size of their fleets at a rate quite beyond that of their competitors. Avoidance of taxation is, therefore, one, and almost certainly the principal, motive.

" Another is to save operating costs, which in some cases are so high that only state subsidy can ensure the continuance of the ships in service. Where in such cases no subsidy is available, the alternative to the fleet ceasing to operate is to transfer it to a flag of convenience. This accounts for the tremendous growth of tanker tonnage, much of it of United States ownership, registered in flag of convenience countries, since only American liner tonnage qualifies for subsidy.

" In the light of these advantages, it may be asked why shipowners in heavily-taxed countries do not resort wholesale to the adoption of flags of convenience. As far as United Kingdom shipowners are concerned, there is their inherent patriotism and pride in the Red Ensign. Currency control, the present restrictions on the transfer of British ships, and questions of domicile of ' the principal place of business ' outside the Commonwealth, all combine to make a formidable series of obstacles. But in the realm of world sea transport a situation has developed with elements of farce about it which must not be allowed to disguise its true significance. Here are a number of countries with no traditional maritime associations emerging as nominal owners of a large block of tonnage. By virtue of this technical ownership they may be able to participate in international discussions and to affect by their vote both maritime law and maritime safety regulations through, for instance, the Intergovernmental Maritime Consultative Organisation, if ever it should be set up. This is a situation which could not have been envisaged either by the sponsors of that organisation or by the countries which have acquiesced in transfer from their flags. The prospect of countries such as Liberia and Costa Rica being used as ' pocket boroughs ' to influence international shipping affairs may seem fantastic—but nevertheless there is that possibility.

" These political possibilities are serious enough, but they may well pale before the effect, in a time of slump, of these untaxed fleets upon those, such as our own, which are finding fleet replacement, even in a period of buoyant world trade, so difficult a problem."

The Liverpool Steam Ship Owners' Association shows the extraordinary growth of these flags of convenience countries in the post-war period in a table which, subject to some necessary degree of estimation, gives the ocean-going ships of 2,000 tons and over compared in number and tonnage with the corresponding ships of the United Kingdom.

Year ended 30th June	United Kingdom No. of Vessels	United Kingdom Total g.r.t. 000	Panama No.	Panama Tons 000	Liberia No.	Liberia Tons 000	Honduras No.	Honduras Tons 000
1939	2,475	15,822	100	600	*nil.*	*nil.*	27	81
1950	2,291	16,333	448	3,241	20	243	76	452
1953	2,246	16,761	492	3,801	140	1,419	80	420
1955	2,294	17,611	462	3,830	408	3,970	67	401

The following table shows how much of the tonnage comprised in these fleets consisted last year of oil tanker tonnages:—

United Kingdom Total Tons 000	United Kingdom Tanker Tonnage 000	Panama Total Tons 000	Panama Tanker Tonnage 000	Liberia Total Tons 000	Liberia Tanker Tonnage 000	Honduras Total Tons 000	Honduras Tanker Tonnage 000
17,611	5,145	3,830	2,072	3,970	2,352	401	153

These figures show, says the Association, that, whilst the larger part of the tonnage at present registered under these flags of convenience is tanker tonnage, there is a substantial quantity of non-tanker tonnage and that their tonnage as a whole has been increasing with remarkable speed over the past five years, during which time the corresponding United Kingdom fleet has done little more than maintain its total strength. Liberia, a country with a population no greater than that of the combined population of Liverpool and Manchester, with practically no overseas trade of its own and no port or other facilities capable of catering for any substantial trade, now only ranks behind the United Kingdom, the United States and Norway in the tonnage of its mercantile marine.

The motive of this remarkable development is tax avoidance and although, says the Association, there are grounds of morality on which such behaviour is open to challenge, it is surely questionable whether either the Governments which give these facilities or the shipowners who take advantage of them are committing any offence for which they can be arraigned at the bar of international law and conduct. Can it be said in the case of the owners concerned that they are in breach of any rule of law in seeking to manage their affairs in such manner as will attract, within the bounds of law, as little liability to taxation as it is possible to arrange?

The Governments concerned are entitled if, with unusual forbearance they so choose, to refrain from levying taxation on persons who, by bringing themselves within their range, risk the consequences in taxation which might normally be expected to ensue. But the ships concerned are thereby placed in position of enormous preferential advantage in competing in the open freight markets

Flags of Convenience—continued

of the world with shipowners of the United Kingdom whose profits are subjected to the present extortionate level of taxation and who, in replacing their ships, have to find far more money than they have been allowed to set aside as depreciation for tax purposes.

Compared with the virtually untaxed profits of the ship registered under one or other of these flags, the shipowner in the United Kingdom, in so far as he makes a taxable profit, pays over half of it to the Inland Revenue. His rival operating under a flag of convenience has no problem of inadequate depreciation allowance or need to worry whether the tax gatherer is leaving him with enough to replace his ships or to extend his activities. The pre-war ship which the United Kingdom owner now owns will cost him, at to-day's price level, nearly five times its original cost to replace, but, apart from the modest help of the investment allowance, all he is allowed to bring into account for tax purposes is a sum equivalent to that original pre-war cost. Ships built between 1946 and 1951 would, if they had to be replaced to-day, cost more than twice their original cost, but when the time comes to replace them, the excess over the original cost will have to be found, if it can be found at all, out of profits put aside after tax has been levied on them, save in so far as some help comes from the investment allowance.

These are the views of the shipowners of Great Britain, with this warning from the Association: that the shipping companies of the United Kingdom can, of themselves, do nothing to counter the advantages thus enjoyed by their new competitors, if they continue to register their ships in the United Kingdom. "It must be conceived," the warning goes on, "that they might be compelled, rather than see themselves driven out of business, to emulate their competitors and seek a registry, not necessarily in the same countries but such as to produce corresponding advantage; or they might be driven to charter from their competitors in a situation of inability to build for themselves, although at risk of giving their competitors a new or greater footing in their own established trades. No doubt H.M. Government could devise a law to prevent action of that kind, but to what avail if the consequence be an accelerated decline of our Merchant Navy and of the all-important contribution it makes in the form of invisible exports to the national overseas trading account? Surely, the right solution is that for which the Association has been contending, namely, a lessening of the burden of United Kingdom taxation to an extent sufficient to restore and maintain the competitive power of the nation's shipping industry."

The difference between the "taxation" levied in Liberia and in the United Kingdom is startling. In Liberia there is a registration fee—a once-for-all payment—of $1.20 per net ton, and the yearly tax is only 10 cents a net ton, with the guarantee that this will not be increased for 20 years. If these figures were applied to a medium-sized Cunarder, such as the "Samaria," whose net tonnage is about 11,000, the registration fee would be in the neighbourhood of £4,000 and the annual tax some £375. Spread over the 20 years of the liner's life, this would represent roughly £575 a year. What the "Samaria" pays in taxation in this country is not generally known, but it is safe to say that it is substantial. We do know from Colonel Denis Bates, the chairman of the Cunard company that in six years the line would have been saved £14,000,000 in taxation had its ships been registered under a flag of convenience, a sum almost sufficient to meet the current commitments for building.

Whether, as hinted by the Liverpool Association, British shipowners could seek a similar remedy to their foreign competitors to escape from the burden of excessive taxation is open to doubt. Sir William Currie, chairman of the Peninsular and Oriental Steam Navigation Company, has stated that apart from patriotic reasons there are a number of other points to be taken into consideration. In the first place, the maximum benefit could be derived from taking the course suggested only by those who do not already attract taxation in their home country. Those who benefit—apart from some United States oil companies who have registered ships under flags of convenience in order to reduce costs—are those who have so ordered their affairs as not to be resident, for tax purposes, in any country which collects taxes from commercial enterprise on a normal and orthodox basis. A British company cannot register its ships under a foreign flag so that, if it found any advantage in making use of a flag of convenience, it would have first to set up a foreign subsidiary to own the ships. But having done so, the profits of the foreign subsidiary would still be subject to United Kingdom tax if remitted to this country.

The mention of reduced operating costs by Sir William Currie underlines the fact that this is the predominant reason why American shipowners — whose operating costs are at least four times greater than those of the United Kingdom or Norway — have so largely adopted the expedient of registration in Panama and Liberia. Conclusive evidence is lacking to justify belief that advantage is taken of this device by foreign shipowners to operate ships that are sub-standard in safety or, in relation to United Kingdom and other European standards, in rates of pay or conditions of service, although absence of governmental supervision and of legal obligation to observe regulations which the maritime nations impose certainly constitute advantages and the saving of expense in the case of these flags.

Mr. H. E. Gorick, the general manager of the Chamber of Shipping, told the Chartered Institute of Secretaries at their annual conference in Dublin that the use of a flag of convenience can hardly fail to give an overwhelmingly superior competitive advantage to those who are able to adopt it. It enables ships to be operated far more cheaply. In times of depression such ships will be able to trade with profit long after those bearing heavy taxation burdens have failed to do so.

This, then, is a broad survey of the situation which has developed with such alarming rapidity in the post-war years. Can any check be put to the practice? Is it desirable that it should be checked? These are questions to which no precise answer has yet been formulated. It is clear that nothing could be achieved except by international agreement. The International Law Commission, which has been revising articles of its "regime of the high seas" on the nationality of merchant ships and the right to a flag, has approved an article which lays down that ships have the nationality of the State whose flag they are entitled to fly and that there must be a "genuine link" between the State and the ship. This seems an eminently sensible view.

Another international body, the International Chamber of Shipping, has also had the matter under review. It decided that the first thing to do was to prepare a factual, objective survey of the whole subject, for the enlightenment not only of the public but of governments also. It was felt that there are so many misconceptions about flags of convenience that the time was opportune for the issue of a kind of White Paper. When this survey is issued—and it is hoped to deal with it in the next issue of this journal—the way will be open for the consideration of the next step.

What is that next step to be? Will Governments be recommended to restrict, or prohibit, the registration of their ships under other flags? In a gathering of representatives of 16 or 17 maritime nations there is bound to be differing views—and those varying viewpoints are as likely as not to be reflected in the Governments concerned.

British Waterways Improvement Schemes.

The British Transport Waterways Division are to spend a further £216,500 on schemes of improvement and expansion on waterways in the North East.

On the Sheffield and South Yorkshire Navigation, which connects Sheffield, Rotherham and Doncaster with the Humber Ports, the single-chamber lock at Long Sandall, at present 70-ft. long and 18-ft. 10½-in. wide, is to be reconstructed as a double-chamber lock 22-ft. wide with an overall length of 215-ft. The new lock will be able to accommodate craft carrying up to 250 tons (the present limit is 90 tons) and will thus remove a serious bottleneck between Goole and Hexthorpe. The total cost of the work will be £105,000.

On the Aire and Calder Navigation the fleet of steel compartment boats used to carry coal from Yorkshire Collieries to Goole Docks for shipment is to be augmented by the purchase of fifty new compartments, at a total cost of £86,500. This traffic by compartment boats has increased from 396,000 tons in 1948 to 680,000 tons in 1955. The new compartments will be constructed by Messrs. Head, Wrightson & Co. Ltd., Stockton-on-Tees.

A £25,000 contract for dredging a length of the River Trent below Cromwell Weir, about five miles downstream from Newark, has been placed with Dredging and Construction Ltd., King's Lynn.

Unpowered Barges Driving Down Docks

Court's refusal to condemn the practice as dangerous

By LAURENCE WEBLEY, LL.B., Barrister-at-Law.

Recently, the Admiralty Division of the High Court had occasion to consider the practice, prevalent in the Port of London, of allowing barges to drive or drift down docks without power. The Court decided the practice was not, necessarily, dangerous: "Blackfriars Lighterage and Cartage Co. v. Hobbs." The action arose because the Lighterage Company, the plaintiffs, sought to limit their liability, under the Merchant Shipping Act 1894, to a lighterman, Mr. Hobbs, who had been injured by a collision between one of their barges and the barge in which he was working

The Lighterage Company accepted liability for the collision. They admitted that it was caused by the faulty navigation of their barge but claimed it was without their actual fault or privity as owners, a necessary condition if they were to bring themselves within the Act. The injured lighterman, the defendant, denied the barge was being navigated or that the collision happened without the plaintiff's fault or privity. He claimed they were at fault in not providing a tug for their barge or adequate equipment to keep her under control.

The barge, the "Landeer," was a 76-ft. vessel. On the day in question she was the middle one of three barges moored in line between the jetty and the wharf on the south side of the King George V Dock. A tug had been arranged to take her to the Royal Albert basin. Before it arrived another tug, owned by Messrs. Vokins, came to take in tow the innermost barge which belonged to that firm. The tug towed all the three barges into the middle of the dock, cast off, and then came round on the starboard helm, to take its own barge in tow. In doing so, the tug gave the "Landeer," by this time cast off from both the other barges, a push which caused her to drift down the dock in an easterly direction. A light S.W. wind was blowing at the time. A barge called the "Durham" was at the next berth to the eastward. She had finished loading and her lighterman, Hobbs, and another man were squaring up the barge and did not see the "Landeer" coming. Before they knew what was happening the "Landeer" over-ran the gunwhale of the "Durham" and Hobbs was squeezed between her head and the stacked cargo and seriously injured.

His Lordship said that, prima facie, one would have thought that the causes leading to the accident were matters of navigation, the responsibility of the owners' servant on the spot. But it was argued by the defendant, Hobbs, that the accident was not the consequence of an act of navigation. It had happened because of the practice, fully known and approved by the owners, of allowing barges to drift about without motive power in the docks, for which the "Landeer" was not suitably equipped. The only tackle aboard her was her anchor and cable, a headfast, and a length of 3-in. rope. If she was to be allowed to drift she should have had an oar or oars and a hitcher, an instrument suitable for both pulling and pushing so that she could be "poked" along. His Lordship remarked that the evidence showed, and anyone sitting in his position would hardly need evidence of a fact so frequently brought to the attention of the Court, that it was indeed the common practice for barges to be allowed to drive without motive power in the London docks. But conditions had altered very much in recent years. In the old days barges were smaller. There were not so many tugs and launches available and it was common and customary for barges to be supplied with oars and hitchers and to be moved about the docks, pulled or manoeuvred by hand, by their own lightermen. But in recent years barges had become larger and so less manoeuvrable, and the number of tugs and launches for shifting them had increased. Accordingly, the need for oars and hitchers had disappeared as, for all practical purposes, they could rely on the tugs which the lighterage companies either owned or hired. But it was still true that many barges were allowed to drift, it might be because the distance was short, or the wind favourable so that the lighterman could take advantage of it to do what was called "blowing down the dock" and sometimes, in his Lordship's experience all too often, because someone else came and cast off a barge which, until then, had been safely tied up.

It was said the owners had taken no steps either to warn their lightermen of the dangers of the practice or, if it could not be stopped, to provide equipment for the barge to be controlled.

His Lordship pointed out that the burden of proof was on the Lighterage Co. to bring themselves within the statute and then said he did not see how the accident arose out of the practice complained of. On the facts, the "Landeer" came adrift because Vokins' tug moved all three barges and left two adrift in the dock. The plaintiff's lighterman had said: "Whether I liked it or not I was cast adrift," and he added it was quite a normal thing to happen. A very experienced witness had said it was quite common to find one of their barges cast off and left adrift and no one ever thought of tying them up again. Supposing, said his Lordship, for the sake of argument, the practice of allowing barges to drift was a dangerous one which barge owners ought to condemn, what could the owners, in their office in London, have done to stop someone else's tug casting off their barge to get at another. But, his Lordship added at once, that he did not think there was, necessarily, any danger in allowing barges to drift without motive power in the docks. He said "necessarily" because circumstances must alter cases. If barges were allowed to drive without motive power in a gale of wind that might well be dangerous. But in a light wind it was very difficult to describe the practice of allowing barges to drift as a dangerous one. Of course, accidents might happen but so far as physical injury was concerned it seemed to his Lordship that it could only arise in most unusual and unlikely conditions which, unhappily, was what had happened here. In these circumstances, his Lordship said it would be quite wrong for him, sitting there, to condemn as universally dangerous a practice so long and regularly adopted by lightermen who did the work of the docks in the Port of London. It was a matter which must be left to the discretion of qualified lightermen on the spot. It was precisely for that reason the lightermen had to go through rigorous training to qualify for their work and why lighterage companies employed qualified lightermen. It seemed to him that the decision to allow a barge to drive down the dock was eminently one of navigation. The evidence showed that the extra equipment suggested by the defendant went far beyond what was necessary. He could not but be impressed by the evidence of the managing director of Braithwaite and Dean and of the outdoor superintendent of the Thames Steam Tug and Lighterage Co. These gentlemen, between them, embodied an enormous experience of the lighterage trade. The latter company operated 650 craft. Their evidence showed that the usual equipment for a barge was only a headfast and a piece of rope apart from the ordinary anchor and cable. On the evidence he could not say that the owners were guilty of fault and privity in not equipping the "Landeer" with the extra equipment suggested. His Lordship declared that, in his view, the accident was caused solely because the man in charge of the "Landeer" was not keeping a good lookout. If he had shouted to the man in charge of the "Durham," and the range of distance was so small that, probably, if he had spoken he could have been easily heard, this accident would never have occurred.

Accordingly, his Lordship concluded it was purely a fault of navigation which could not be laid at the owners' door. The Lighterage Company's liability was, therefore, limited to £1,282 10s.

His Lordship added that one must feel sympathy with the defendant who had suffered grievous personal injury through no fault of his own. Unhappily, the limit of liability—£15 a ton—was fixed nearly 100 years ago when the value of money was very different. There were cases to-day when the limitation was quite out of line with the realities of the case. He understood that consideration was being given to increasing the limit. The Court would have every sympathy with such a move which was overdue.

It would, clearly, have been unfortunate if the Court had felt bound to condemn a system so much a part of the working of the docks. It is not likely that anybody concerned with dock work would wish to quarrel with the Court's view that these are matters which must be left to the discretion of the competent man on the spot to do as he thinks best in the conditions prevailing at the time.

Royal Group of Docks, Port of London

Reconstruction of Gallions Lock Entrance

By G. L. SPEAR, A.M.I.C.E.

(Continued from page 9)

12. New Emergency Dam Positions.

Advantage was taken of the drying out of the lock to construct additional hollow quoins and cills at the dock end knuckles and river bellmouth respectively.

It will now be possible, should the need ever arise, to construct two very simple and inexpensive dams by restepping two pairs of the lock gates in these new positions, where they will sit directly on the concrete bottom and be pulled into position by wire ropes. The lock could then be dewatered and routine or emergency work easily executed. Fig. 6 shows part of one of these new positions.

The cill at the dock end of the lock was constructed mainly underwater by depositing concrete through a "tremie" or pipe and was completed after the lock was dewatered. There were two reasons for this, the first was that it enabled the thrust of the dam to be transferred directly to the lock invert and the second was that it would have been difficult to excavate to the required formation depth in front of the dam once it was subjected to the full pressure head of water.

The method of construction was to excavate into the ballast to the required depth and then lay a series of box shutters. Alternate bays were concreted and averaged 105 cubic yards each. The sections were radially jointed in order to form an inverted arch between the lock walls to resist any hydrostatic uplift.

The cills were completed in the dry by dressing down the tremie concrete to correct level and concreting in special cills section which included a machined 8-in. x 8-in. x 1-in. rolled steel angle as the cill meeting face.

The hollow quoins were constructed in concrete in recesses cut in walls and to ensure smoothness, accuracy of line, etc., the quoin shuttering was in one continuous run formed of plywood built on framings around a special steel pile.

After construction the quoins were partly filled with protective fendering.

The outer cill was sited across part of the lock structure. This was the bellmouth apron which consisted of 5-ft. of worn brickwork and concrete. It was therefore necessary to excavate to a depth of 10-ft. and to reconstruct in concrete, but as the standing water level was only 1-ft. below the surface level and the nearness of the dam and river made excessive pumping very unsafe, it was decided to attempt to seal the surrounding ballast by chemical consolidation.

Using the Guttman process a total of 347 boreholes were made and consolidated. The process proved very successful and excavation was made with very little water trouble.

As with the inner gate position, the cill was constructed in a series of bays all with radial lateral joints but this work was, of course, carried out completely in the dry. The cill meeting face section and the concrete hollow quoins were also constructed as for the inner cill.

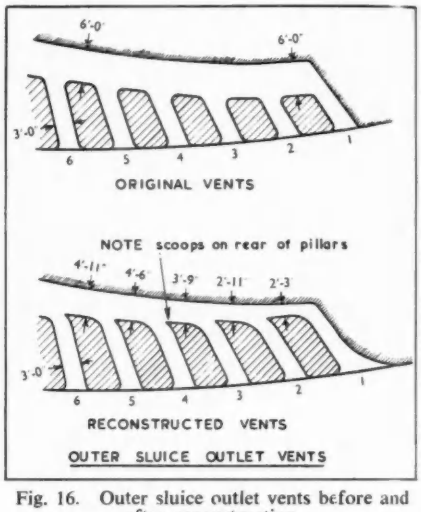

Fig. 16. Outer sluice outlet vents before and after reconstruction.

Although the new sections of the lock invert were constructed to withstand hydrostatic uplift, they were also provided as an additional precaution, with 3 large vents at each position. (See Fig. 6.) Each vent, which was packed with graded ballast, was 24-in. diameter at the base tapering to 9-in. diameter at the surface where it was stopped with a loose fitting concrete plug.

13. Lock Sluices.

The Gault brickwork of the lock sluiceways, which pass the water around the back of each lock gate, was found to be in fair condition and only required general overhaul and repointing in places.

The granite-work, however, of the paddle slides was found to be badly worn on the slide surfaces and spalled at most joints. In addition there were several cracked stones. Repair work was difficult as the working space available was very restricted.

But cutting back the rubbing face of the granite work up to 2-in. a certain amount of the spalled joints and edges were automatically rectified but new and dovetail stone repairs were the only answer in other cases. Because of the limited space and the fact that all this work had to be carried out by artificial light, progress was slow and costly.

Alterations were made to the granite sluice design which allowed a slightly wider greenheart paddle to be used, gave a larger rubbing area, and permitted the addition of a 1-in. bullnose around the granite edge which should discourage future spalling.

14. Contractor's Site Lighting.

Shortly after the lock was dewatered a

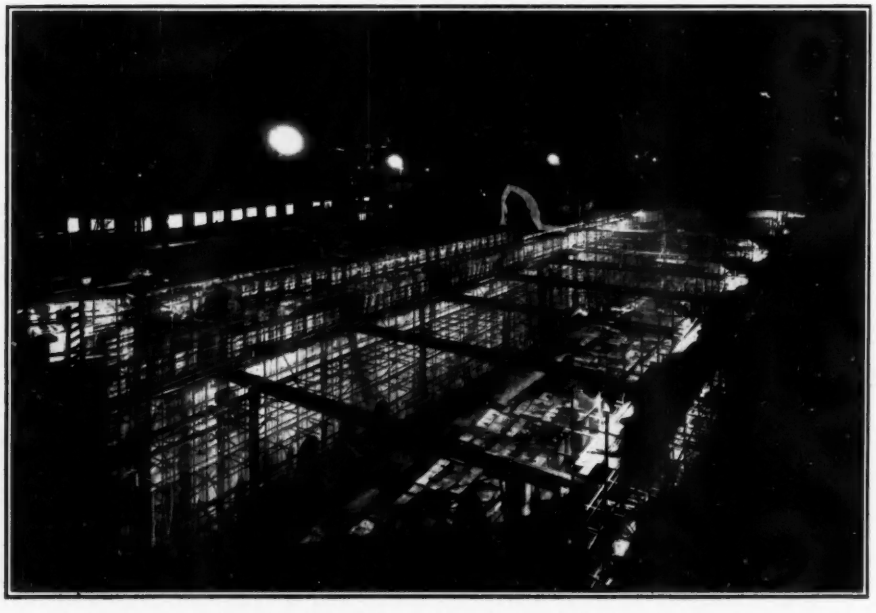

Fig. 15. Contractors' winter site lighting. The tubular scaffolding for the new concrete facing to the lock wall is clearly seen in this picture.

Port of London—continued

Fig. 17. Outer sluice outlet vents (left) before reconstruction and (right) after completion of work.

night lighting system consisting of numerous 500 watt sodium discharge lamps was installed around the lock and the site area.

The main purpose of the lighting was to enable the Contractor to maintain a full working day throughout the winter months when the hours of daylight are so limited, but it was also available for night lighting for normal work or in an emergency.

Fig. 15, which is night photograph of the lighting, clearly shows the degree of illumination achieved. The scaffolding seen is that which was used for the refacing of the concrete walls.

15. River Bellmouth Sluice Discharge.

Each outer sluiceway was originally constructed to discharge through six lateral vents but these did not distribute the flow of water evenly, with the result that, over the years, a large scour-hole had been cut down in the ballast and chalk off the end of the bellmouth between the jetties. This had slightly undermined the apron.

Attempts had, from time to time, been made to seal up the undermined section of the apron by placing bags of concrete and other filling in the cavity, but these were soon removed by the action of the water.

In order to find a suitable remedy a 1 in 20 scale hydraulic model of the bellmouth section was made under the directions of Sir Claud Inglis, C.I.E., M.A.I., M.I.C.E., F.R.S., Director of The Hydraulic Research Station at Wallingford, and investigations made into the behaviour of the sluice discharge.

The existing outlets were reproduced in the model and the scouring studied. Various modifications were made and eventually a design was evolved in which scoop shaped additions were made to the backs of the five piers separating the outlets and the outer edge of the outer vent was flared. These modifications produced an even flow from the outlets and greatly reduced scour.

The lower louvres were modified accordingly and during the filling of the lock when water to the outer section was passed by these sluices it was seen that the vent discharge was very evenly distributed. Figs. 16 and 17 both give before and after details of this modification.

16. Refacing of Lock Walls.

The original lock walls were built of mass concrete and faced in 13½-in. thick gault brickwork bonded into the concrete by 13½-in. deep x 18-in. wide vertical brick fins occurring every 4½-ft.

Over the years the heavy wear on the brick facing had fractured many of these fins, with the result that the facing had pulled away from the concrete in places.

Various repairs had been made, usually by drilling a series of holes through both brick and concrete and grouting in anchor bolts, but on the south side of the lock a length had been repaired by replacing the facing completely in timber.

Examination of this wall in the dry after the lock had been dewatered, had revealed that nearly all the facing was insecure, and in view of this, and the extent of the damage to the face brickwork from craft, it was decided to completely replace the lock walls in reinforced concrete.

The brickwork was removed and the wall facing skinned back to clean concrete. The brick fins, most of which were found to be in good condition, were cut out in parts to form a series of vertical slots on the wall facing. (See Fig. 12.) Philbolt anchors, 1-in. in diameter, were fixed to the wall face 4½-ft. apart vertically and 3-ft. apart horizontally and after the fixing of the reinforcement the new concrete face was constructed in 3-ft. lifts. Fig. 18 shows details of the wall after removal of the loose facing and Fig. 15 the scaffolding required for the new work.

17. River Jetties.

Two-thirds of the North Jetty and half of the South Jetty have been reconditioned in hardwood timber, retaining only the piles or, in many cases, pile stumps of the original construction. Ekki and Jarrah hardwoods were used throughout except for decking joists.

The inner third of the North Jetty is being built with a 4-ft. deep reinforced concrete deck on a series of vertical box piles driven through the ballast, and 9-ft. into the chalk. This section of the jetty is in four separate sections to limit possible damage, and is protected by independent fender piles.

Fig. 18. Inner gates during construction. Rear of inner dam and Royal Albert Dock Basin can be seen in the background. Note the drill holes for explosives and "Siskol" slots on invert haunches on right of picture.

Port of London—continued

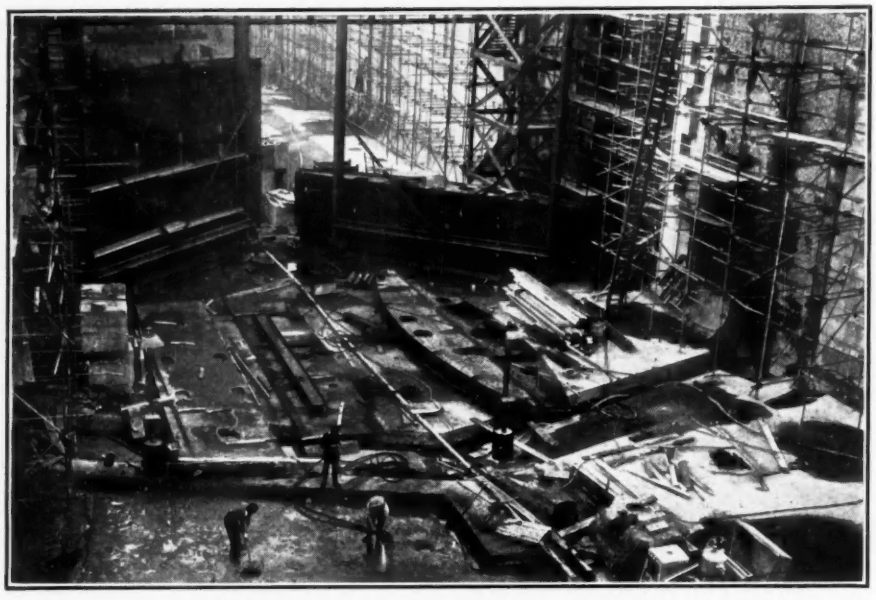

Fig. 19. Outer gates under construction. The outer emergency dam position and resurfacing of the bellmouth apron can be seen in the foreground.

The outer section of the South lead-in jetty and the outer section of the adjoining lock jetty are being reconditioned by a straight spring fender beam 120-ft. long between two dolphins. The dolphins will be of similar construction in steel and concrete to the inner section of the North Jetty. The fender beam will consist mainly of a row of high tensile Broad Flange Beams 22-in. x 12-in. driven at a forward batter of 1 in 5 and at an average of 4-ft. centres. The piles will be capped by an 8-ft. wide by 10-ft. deep continuous reinforced concrete deck beam under whose weight they will deflect forward about 5-in.

18. New Lock Gates.

The original mitre lock gates were of the single skin rivetted type and the weight of each leaf was carried partly on the gate pintle and partly on a large cast iron roller running on a curved path on the gate platform. The movement of the leaf was controlled by two chains operated by hydraulic machinery.

There are various disadvantages with this type of gate of which the most significant are that the gates may often be obstructed by debris on the roller path, the chains can be an obstruction and require constant maintenance and after a gate has been in operation for a few years, the accumulation of solid mud on the gate ribs may add greatly to the weight.

The Contract included the provision of three pairs of new mitre lock gates. These are of all welded mild steel and are of the semi-buoyant type where the lower part of each gate leaf is a twin buoyancy chamber, the top level of which is so arranged that under fully drowned conditions the gate has a preponderance of 10 per cent. of its total weight of 135 tons, which includes fendering and walkway. The gates are thus within the lifting capacity of 150 tons of the P.L.A. floating crane " London Mammoth."

In addition to the usual large trunks from the walkway down to the buoyancy chambers there are special 3-in. diameter air ducts from just below walkway level, where they have flanged inlets, to the far bottom extreme corner of the buoyancy chambers. With these, fresh air can be circulated prior to any inspection.

The Sub-Contractors for the provision of the gates were Messrs. Head, Wrightson & Co. Ltd., who shaped and cut to size in their workshops at Thornaby-on-Tees, all the materials other than the timber. This was then delivered, in plate and sections, etc., to the site by road transport.

The gates were assembled in the vertical position on timber rafts in the lock bottom adjacent to the hollow quoins into which they were to be stepped for operational working.

Apart from the butt joints in skin plates which had one sealing run of weld, the gates were completely assembled in sequence of decks, diaphragms, heel and mitre posts, by tack welding.

The final welding, which by careful design included the minimum of overhead work, was then carried out, with frequent check surveys to control any possible distortion.

Greenheart sills and posts were next fitted and dressed to the dimensions of the reconditioned granite quoins and sills.

The gates were then rolled into position, lowered onto the pintles and connected up with the new anchorages and machinery.

In addition to the Authority's normal supervision, the accuracy and quality of materials and fabrication, both at Thornaby-on-Tees and on the site were checked by Lloyds surveyors.

Figs. 18 and 19 are photographs of gates under construction. Fig. 21 shows gate details.

19. Lockside Machinery.

All lockside machinery up to the date of the reconstruction had been operated from the dock hydraulic system but this method of operation is being replaced whenever possible.

The change over from hydraulic to electrical operation entailed the installation of

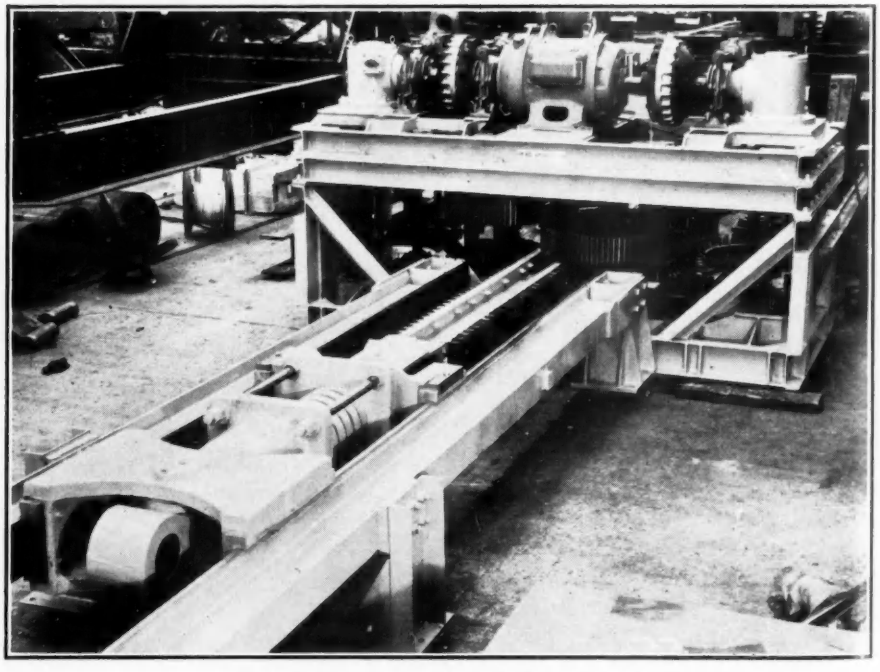

Fig. 20. Lock gate machinery before installation.

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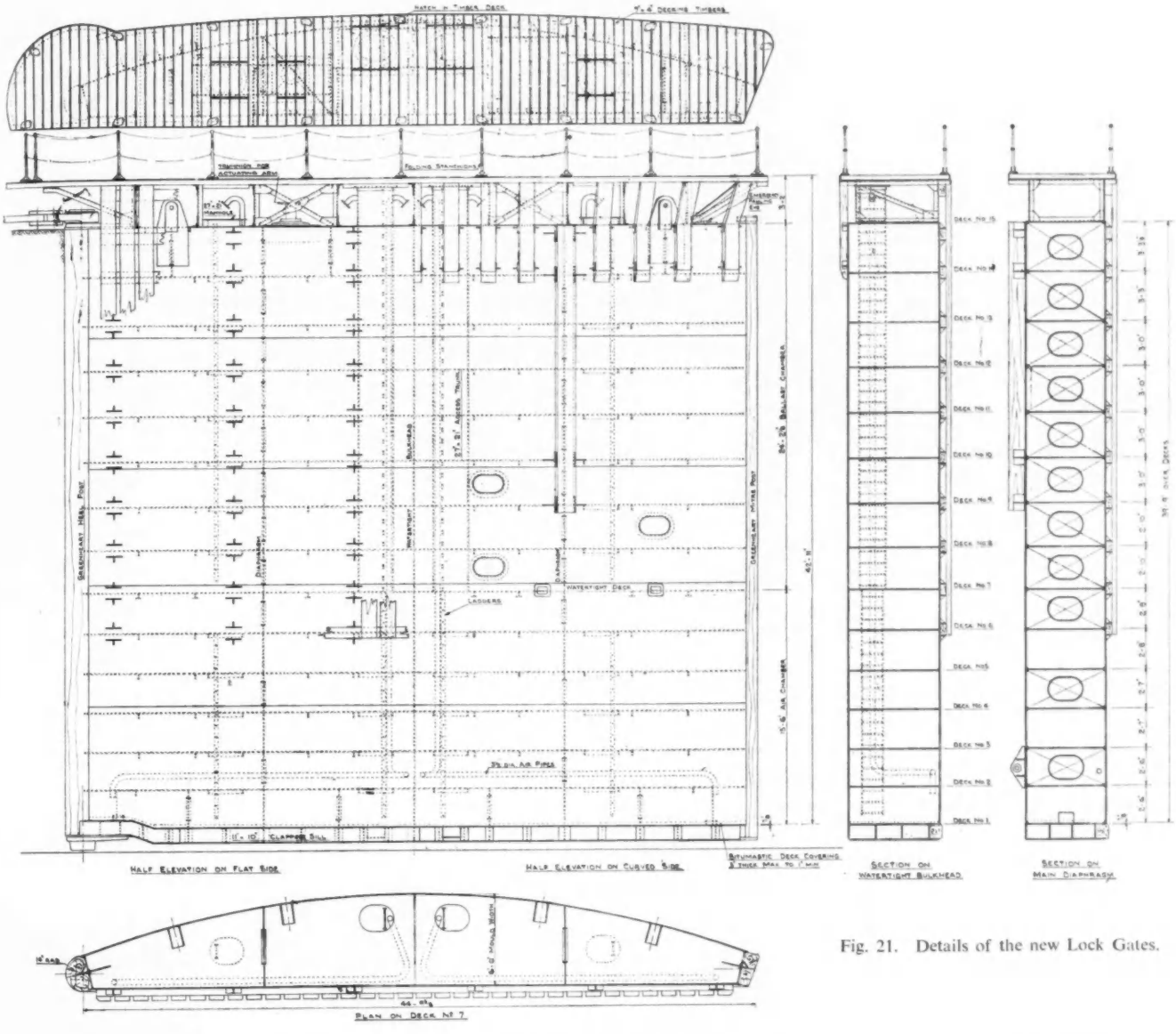

HALF ELEVATION ON FLAT SIDE
HALF ELEVATION ON CURVED SIDE
SECTION ON WATERTIGHT BULKHEAD
SECTION ON MAIN DIAPHRAGM
PLAN ON DECK No 7

Fig. 21. Details of the new Lock Gates.

nearly all new machinery as very little of the original was suitable for conversion. Those mainly involved were the gate operating machines, the lock sluice operating machines and the capstans.

1. **Lock Gate Machinery.**

Fig. 20 is a photograph of a power unit before installation. It can be seen that it consists of an A.C. electric motor operating two identical gear systems and giving final drive by means of two pinions to a back to back double rack.

The thrust from this rack is taken in turn by a crosshead running between two guides. The movement is then transferred to the lock gate by a connecting rod.

There are four features of this power unit which are not obvious in the photograph, but which are an integral part of it. These are:—

(a) fluid drive coupings on both sides of the electric motor which, apart from ensuring smooth take up of power, also ensure an even distribution of load to the two halves of the power unit.

(b) travel limit switches which automatically stop the motor when the gate has reached the end of its travel.

(c) solenoid brakes which are released only during gate operation, and are automatically applied if the machine is deliberately stopped. This prevents over-run.

(d) a friction gear wheel included in each half of the power unit consisting of two concentric rings locked together by a series of compression springs, the compression in these springs being pre-set to give slip at a pre-determined load. This will prevent damage to the gearing in case of an accident to the gate leaf.

(e) a shock absorber of the double acting helical spring type incorporated in the crosshead slide at the front of the rack. This will ensure smooth transmission and will also help to absorb the force of any collision with the gates.

The electric motor is 27.5 h.p. and the power unit is designed to give up to a 25 ton thrust or pull to the gate. The time of operation from recess to mitre and vice versa is 1½ minutes and all the gate movement is at a single speed.

Fig. 22 is a diagrammatic view of the gate machinery after installation.

2. **Lock Sluice Machinery.**

The original machinery for each of the six sluices consisted of a large vertical water operated hydraulic cylinder operating a crosshead to which was fixed the large greenheart sluice paddle.

The conversion consisted of providing a new greenheart paddle, crosshead and the

Port of London — continued

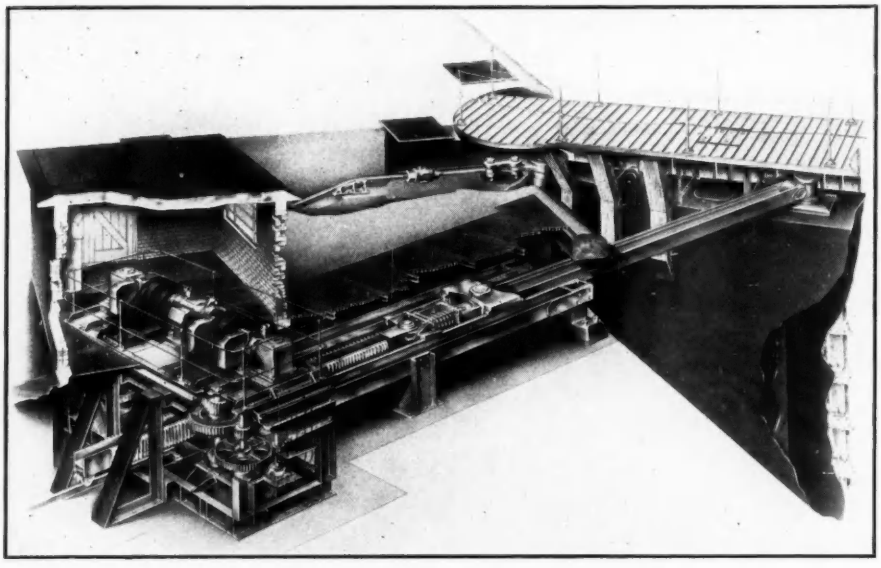


Fig. 22. Diagrammatic view of new lock gate machinery.

necessary guides, and the reconditioning of the cylinder so that it would be suitable for oil hydraulic operation.

Each sluice has been provided with an independent 20 h.p. oil hydraulic self-contained power unit which provides up to 900 lbs. per square inch pressure and raises or lowers the paddle in 2 and 2½ minutes respectively.

3. **Capstans.**

Five 5-ton pull and one 10-ton pull capstans, operated by 40 and 80 h.p. electric motors respectively, have been provided and installed at the lockside.

Each capstan is reversible and is operated by two foot pedals on the top of the cast iron boxes which house the power units. The drums are the two tier type and give speeds of 75 and 135-ft. per minute.

20. Lockside Machinery Buildings.

A combined machinery and control building has been built at each gate leaf position and houses the following:—

(a) gate machinery;
(b) lock sluice hydraulic power unit;
(c) multi contactor box containing the electric contactors for the machinery of gate, sluice and nearby capstan.

The control of the gates and sluices is by push button control panels set in recesses on the front of the machinery buildings. These have been so arranged that normally all operation is from the south side of the lock, but in fog or other emergency the units on the North side can be operated independently.

A safety device has been incorporated by which it has been made impossible to raise any sluice until the gates are properly closed and no control can be operated without the master key.

21. New Lockside Lighting.

Existing forms of entrance lock lighting either use 1,000 watt filament lamps in "Duoflux" type fittings or 500 watt filament lamps in "P.L.A." type Dockside fittings. The fittings are generally spaced about 100-ft. apart; 30-ft. back from the cope edge and are mounted at a height of 30-ft. above the lock side paving.

This gives an average level of illumination on the apron of about ¾ lumens per square foot in the case of the 1,000 watt lamps and about 0.4 lumens per square foot in the case of the 500 watt lamps.

On the reconstructed entrance it was decided for uniformity to use reinforced concrete road lighting standards of the type now used throughout the dock and providing a lower mounting height of 25-ft. The standards were positioned at the back of the lockside paving, the lights being 24-ft. back from the cope edge.

Tests were carried out using pairs of the following:—

(i) 1,000 watt filament lamps in "Duoflux" fitting.

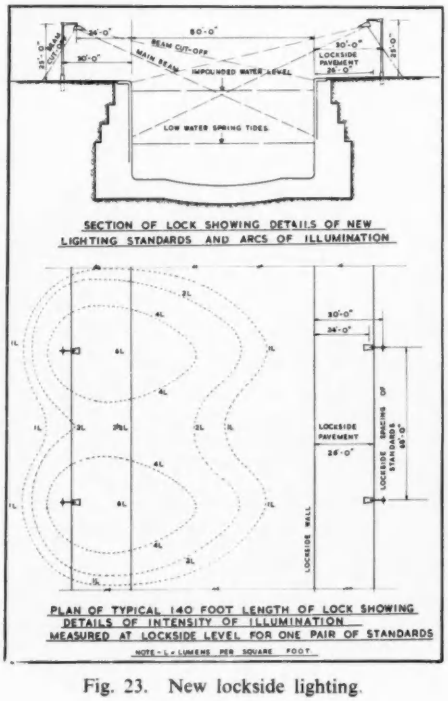

SECTION OF LOCK SHOWING DETAILS OF NEW LIGHTING STANDARDS AND ARCS OF ILLUMINATION
PLAN OF TYPICAL 140 FOOT LENGTH OF LOCK SHOWING DETAILS OF INTENSITY OF ILLUMINATION MEASURED AT LOCKSIDE LEVEL FOR ONE PAIR OF STANDARDS
NOTE - L = LUMENS PER SQUARE FOOT

Fig. 23. New lockside lighting.

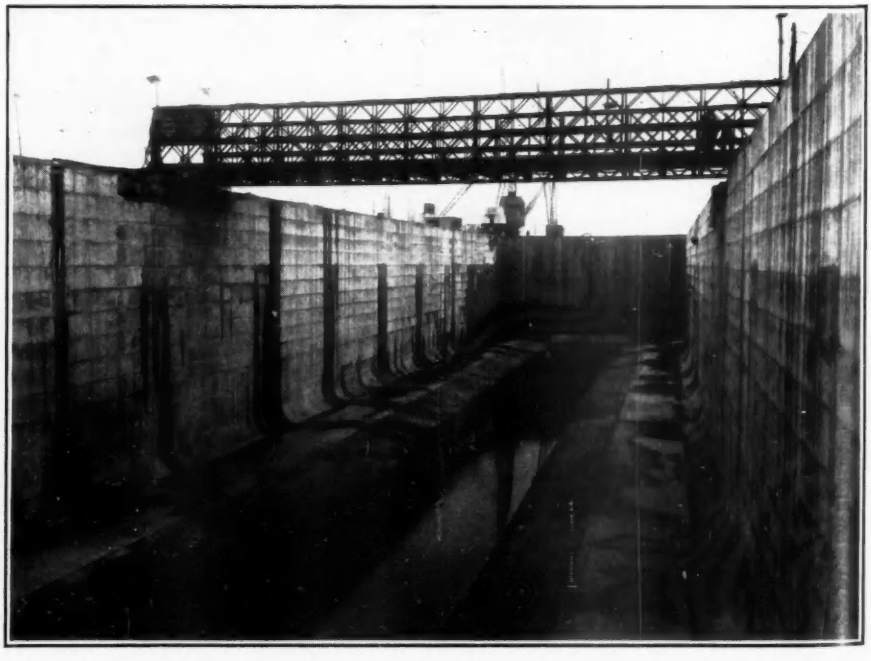


Fig. 24. The finished lock ready for the return of water. The water on the invert is from sluice tests. Compare new profile with original curved invert shown in Fig. 3.

Port of London—continued

(ii) 400 watt MBF/U lamps in "Duoflux" fittings.
(iii) 400 watt MBF/U lamps in "Dog Track" fittings.
(iv) 400 watt MBF/U lamps in "P.L.A." Dockside fittings.
(v) 500 watt filament lamps in "P.L.A." Dockside fittings.

As a result of the tests it was decided to use 400 watt MBF/U lamps in "Duoflux" fittings, arranged to beam on a point on the far side of the lock wall, 25-ft. below the cope level.

With a spacing of 68-ft. this gives an average illumination of more than 4 lumens per square foot on the working area at the lockside with a maximum of 6 and a minimum of 2 lumens per square foot. Details of the arrangement of the standards and the intensity of lighting on the lockside are shown on Fig. 23.

It is estimated that this improved illumination will be obtained with an increase in annual charges of only 25 per cent.

The "Duoflux" type of fitting in addition to beaming the light in the required direction gives good cut-off characteristics to prevent glare from the lamps on the bridge of a ship whether approaching or within the lock.

On the lead-in jetties where it is not necessary to project the light across the entrance but only to illuminate the surface of the jetty, 500 watt filament lamps in "P.L.A." Dockside fittings were used as these fully shroud the lamp and give good screening from the river.

The lamps are so connected that alternate lamps can be switched out when the entrance is not being used.

22. Lockside Accommodation and Equipment.

Completely new lockside accommodation has been provided and consists of a large lock operating building, a combined central rope store and lavatory building on each side of the lock and a police box.

The operating building, although sited alongside this lock, is for the control also of the adjacent smaller lock and houses the full personnel for both.

The improved reconstructed lockside which includes a new 26-ft. wide concrete pavement, has been completely re-equipped with fittings such as fairleads, life ladders, rope fenders and the usual wall tide gauges cut in the quoin granite work on each side of every gate position.

In addition, a special float operated tide gauge has been provided near the new lock operating building, in which the height of the river over the lock cills is clearly indicated, both by day and night, at a gauge box which is sited 27-ft. back from the lockside. An electronic repeater has been incorporated in this gauge and, through an automatic recorder at the nearby impounding station, will control the automatic starting of the dock impounding pumps.

Conclusion.

In a reconstruction of an underwater structure such as this, not only is it impossible to anticipate before dewatering the full nature and extent of the repairs and modifications that will be required, but also the many engineering problems that will inevitably arise. This presents difficulties and problems which call for sound engineering and meticulous attention to quality and detail, both of design and construction.

It will only be after decade or two of useful and trouble free operation that the success of a project of this nature can be established, but the Author has every expectation that those concerned in this work will prove to have carried out a sound engineering job.

Acknowledgments.

The reconstruction of Gallions Lock Entrance was carried out for the Port of London Authority under the direction of their Chief Engineer, Mr. G. A. Wilson, M.Eng., M.I.C.E., M.I.Mech.E., by the main contractors Messrs. John Mowlem & Company Limited. The resident engineer was Mr. G. L. Spear, A.M.I.C.A., and the Contractor's agent was Mr. J. R. Malcolm, B.Sc., M.I.C.E.

Productivity in Freight Handling

Review of Progress in the Docks Industry

A record of recent progress in the docks industry is contained, inter alia, in the British Productivity Council's Review on "Freight Handling" which was issued recently. The report was produced to show that in all three of the main handling organisations (rail, road and docks) a considerable amount of energy and money have been expended in trying to reach higher levels of efficiency and that the transport industry as a whole has been alive to its responsibilities.

In the chapter dealing with the docks industry the Review attempts to show that, in spite of complications, some real progress has been made and states that the fact that so much development has taken place gives rise to the hope that the future will see an increase of efficiency in the handling of cargoes and in a quicker turn-round of ships. The Review also suggests that while it is recognised that there is a strong resistance by dock workers to altering existing systems, the greater use of work study in the docks would be a challenge to the Unions to persuade the men that they stand to gain by its introduction. Other points of general interest are as follows:—

Labour Relations.

Though it is not proposed to lay emphasis on incidental labour relationships, it would be unrealistic to avoid mention of them, particularly where freight handling in the docks is concerned. One point immediately apparent to anybody making even a cursory survey of the dock industry is that there is no lack of know-how about handling equipment. It is virtually certain that if money were no object and labour relationships were as peaceable as in, say, agriculture or the iron and steel industry, then British docks would be the show-piece of the world. But feelings of deep mistrust are a melancholy feature of the dock industry. Mistrust exists not only between employer and employee but sometimes also between dock worker and local dock labour board, between dock worker and trade union, and between other sectional groups. Feelings are by no means as intense in some ports as in others, but there is little attempt by dock organisations to deny that they exist. Though they have undoubtedly generally retarded the rate of development in dock freight handling they have been overcome in some areas, thereby enabling important progress to be made.

Tonnages Handled.

To-day British docks are handling 50 per cent. more import tonnage and over twice as much general export tonnage as formerly. The size of the dock labour force has not materially increased since 1938 (it is now approximately 80,000), but the pre-war labour force was augmented whenever required by non-registered dock workers who followed seasonal traffic.

A point often referred to by people who express concern at the existing facilities in British docks is that many ships prefer to use foreign rather than British ports for the discharge of some commodities because the cost is appreciably lower. Various reasons are advanced for the faster turn-round time at some Continental ports, but often the complaints are confined to accusations of restrictive practices levelled against British dockers. Many restrictive practices undoubtedly exist, but points that are all too often ignored are that (a) Continental ports such as Rotterdam and Hamburg have been completely rebuilt since the war with all the latest facilities for loading, discharging and warehousing; (b) the amount of traffic handled is far less than in London; and (c) the men work longer hours although with a lower output per gang-hour. Moreover, much use can be made of river and canal craft, whereby discharge is accelerated.

Provision of Port Facilities.

The method of employing labour in the docks is unique in the diversity which exists between the man's actual employer (who may be the port authority or one of the employing bodies with facilities for operating at the port) and his legal employer, which is the local dock labour board. The actual employer pays the man's wages not to the man direct but through the dock labour board, which acts as a central paying agency. In the dock labour board is also vested responsibility for discipline, the employer's part in

Productivity in Freight Handling—continued

this connection being limited to reporting an offence to the board. The majority of dock workers are employed for one job at a time and when that job is completed they present themselves for further work at the next call-on. Particularly in a large port this system means that a dock worker moves from one employer to another and has not the same feelings of loyalty as has an employee in any other industry. Even if no work is available every dock worker is assured of a minimum weekly wage provided he complies with the conditions of the Dock Labour Scheme.

Post-war progress in freight handling has been subject to important influences. Some of the larger ports (especially London and Merseyside) sustained extensive damage during the war. Already more than £30 million has been spent by the Port of London Authority on repair or rehabilitation of accommodation. It is undoubtedly a tribute to all concerned with operations at the P.L.A. docks that despite the limited berth space available, particularly in early post-war years, the annual tonnage of export cargo handled over the quays of the authority's enclosed docks has in each year since 1946 been at least double the average amount handled in a pre-war year and by 1954 had risen to 2,000,000 tons from a total of 744,000 tons handled in 1939. Nor have provincial ports been backward in well-doing. The Clyde Navigation Trust has agreed to provide a new granary at Glasgow at a cost of £2 million. Capital work at Bristol at the beginning of 1954, also estimated to cost in the region of £2 million, included the construction of piers and jetties and a new wharf at Portishead Dock and the provision of improved cranage facilities and road and rail access. At Liverpool itself, where extensive damage was caused by air raids, new transit sheds have been built, a vast scheme of dock reconstruction is in hand and new methods of handling cargo has been introduced On the Tyne a new iron-ore quay has been installed at a cost of about £2 million, besides a new coaling staithe valued at £450,000. The British Transport Commission became owners in 1948 of many commercial docks. It has authorised improvement of their facilities at a cost of over £12 million, including £4½ million for new cranes and coaling appliances. Considerable sums have been spent on other equipment. To aid speedy turn-round the new transit shed and passenger terminal for Union Castle ships at Southampton has been completed (£900,000). Major schemes have been passed for Hull (£950,000), the Hartlepools (570,000) and Middlesbrough (£470,000). The trade unions have been consulted and have co-operated, the men readily accepting new methods.

Labour Shortage.

Throughout the country, dock and wharf operators have continued to be faced with demands from shipping companies for the maximum number of ship berths to handle cargo of greater tonnage than pre-war. At the same time the quickest possible turn-round of vessels has been required, so as to reduce the number of unremunerative days in port to a minimum. Efforts to meet these requirements have been hampered to some extent by labour shortage. Before, the war, owing to the general employment position, an almost unlimited labour force was available but, with the inception of the National Dock Labour Corporation and its successor, the National Dock Labour Board, a restriction has been imposed on its size (although no such provision was included in the board's original terms). This has meant that at times requirements have not been fully met, and on some occasions a serious shortage has been experienced. Whether or not the restriction is justified is a matter for argument (although in these days of full employment it is difficult to find sources of additional manpower), but the basic factors governing requirements are not in dispute. The movement of ships in and out of port is dependent on weather and tide, the volume and nature of the cargoes carried, seasons and harvests—even sometimes on political, economic and social changes, trade pacts and recessions. To meet all these and other variables, and to ensure the quickest possible turn-round of ships, employers have always tended to demand a reserve of labour adequate to meet all probable needs. The National Dock Labour Board Scheme has had as one of its aims the bringing of these demands for labour within manageable proportions, but whether or not it has been successful is in some doubt.

Another difficulty has been the unwillingness of labour to depart from the one-shift system of working, coupled at times with restriction on the amount of overtime and a lack of mobility (for example, men may insist on waiting at the conclusion of a job until the next call-on before reporting for another job, or will not move from hatchwork to quay work when urgently needed to do so). One of the difficulties of the National Dock Labour Scheme seems to be that it operates on the assumption that all dock workers are interchangeable. Whereas in any other industry some attempt is made to place workers in the jobs for which they are best fitted and to keep them there, the dock system assumes that workers have to do any job that comes along, whether heavy or light. This, of course, is particularly hard on the older and less able men. When it is considered that a substantial number are past the prime of life, their inevitably slower rate of working is bound to affect the rate of output of those gangs in which they are employed. Unsatisfactory as that position is, it is further aggravated by the fact that many of the heavier or more unpleasant jobs are unpopular; very often it is the least able dock workers left in the call-stands at the end of the call-on who have to do them. Approximately 10 per cent. of the dock labour force is made up of men of 65 or over, or partially disabled.

Manning Scales.

In many ports the introduction of new handling equipment has been largely responsible for the increases in productivity. Unfortunately, the full effect of mechanisation has not been felt owing largely to reluctance to accept any reduction in the gang manning scales. This reluctance is by no means universal, however, and in view of the industry's pre-war history, is a matter for sympathetic understanding. During an inquiry by the Working Party on Increased Mechanisation in the U.K. Ports (its report was published in 1950) the dock workers' representatives emphasised that they were suspicious of mechanisation on two grounds. They were afraid (a) that the financial advantages might accrue only to the employers and (b) that a reduction in the manning scales which the employers might regard as an essential consequence of mechanisation would possibly cause redundancy among dock workers. These fears have been generally recognised among the employers, and the London Chamber of Commerce, in its final report on the working of London docks, issued in November, 1955, urged that the port employers should make the strongest possible effort to convince both dock workers and their unions that there was no intention of seeking to revert to pre-war conditions in the docks. Employers were also urged to point out to dock workers the mutual disadvantages which would result from a reduction in exports and delays at the docks, and also to spare no effort in obtaining the goodwill of the men. Assurances have in fact been given already by the employers on the question of redundancy, and generally they have displayed willingness to recognise that after making due allowance for the cost of new equipment benefits derived from its use should be shared.

While these assurances and arguments have not universally prevailed it must be emphasised again that there has not been unvarying opposition to any reduction in manning scales. The Port of London Authority in its negotiations with labour applies the policy of adjusting working methods to accord with the introduction of mechanical equipment and to determining the most effective manning scale to ensure maximum efficiency. It is not a matter of by how many men can existing manning scales be reduced, but what men are necessary and how best can they be deployed? During an experimental period at one berth during negotiations full mobility was enjoyed, so that men temporarily idle on one phase of the work were willing to supplement men engaged on other work who were temporarily in need of assistance. In the ultimate settlement the full benefit of this mobility was denied to the employers by labour but agreement was reached, nevertheless, on new manning scales which avoided an excessive number of men being employed, increased gang output by 30 per cent. and produced substantially increased earnings for the men with less physical effort. The cost of providing and maintaining the mechanical equipment was greater than the saving in labour costs, so that the men received a generous proportion of the savings in labour costs while the employers paid out additional costs for

Productivity in Freight Handling—continued

the benefit of increased efficiency. This settlement, which has been extended from one to five berths, has not resulted in any labour redundancy but has increased the business of the port and produced greater earnings for all concerned.

So long as the memories of pre-war days and of the attitude of mind towards casual employment endure the likelihood of close co-operation between employers and dock workers is almost bound to be an ideal rather than a practicable goal. At present degrees of distrust persist on both sides, so presumably the best than can be hoped for in the near future is a willingness by both parties to receive proposals submitted by the other side as honest of purpose and made with the object of bettering the industry as a whole. Once this stage has been reached then co-operative working, in the true sense of the term, may at least be said to be within the bounds of possibility.

Results of Mechanisation.

In the Port of London Authority docks many items of standard mechanical handling equipment applicable to dock working are to be found. The P.L.A. has stated that owing to the serious shortage of dock workers in post-war years introduction of new equipment has been essential. Although it has not always meant a reduction of handling costs, there is no doubt that without it the docks dould not have been able to deal with the increased traffic thrust upon them. Furthermore, the cost per ton of handling would undoubtedly have gone up had it not been for extensive mechanisation.

Among individual items of equipment a large number of obsolescent hydraulic quay cranes have now been replaced by electric cranes, and in order to keep in step with the tendency to build larger cargo vessels, many of the cranes have been equipped with an effective working radius of 80-ft. at maximum capacity as compared with a 60—65-ft. radius which was standard before the war.

London's docks, like the majority in the country, have found the mobile crane most useful in expediting the handling of cargo. Since 1945 a large proportion of exports has been in the form of heavy or bulky packages not capable of being manhandled. This change, combined with the vastly increased tonnages being received for shipment, and the fact that all quay cranes are required for handling cargo to or from ships and cannot be spared for duties capable of being performed by mobile cranes, has meant that the latter have become indispensable for the unloading of export cargo from road or rail conveyance. The mobile crane has also proved its worth in the handling of import traffic—particularly of heavy or bulky packages, for piling cargo in the open and for landing cargo from craft at points where it is impracticable (in the absence of electrical or hydraulic power) to operate a quay crane. All manipulators of cargo now find it essential to utilise mobile cranes and the Port of London Authority alone operates a fleet of 161 of various capacities, in addition to 22 rail-mounted steam or diesel cranes.

Whatever advantages may have been derived from cranes probably the most outstanding item of equipment to be introduced into the docks since the war has been the fork-lift truck. Admittedly palletisation has arrived late at the docks, but the delay was due to the necessity of designing a machine sufficiently robust to stand up to very rough usage on uneven surfaces. The P.L.A. took a leading part in adapting fork-lift trucks for dock work and has probably been more successful than the majority of other employers in experiments in this field. It now operates a fleet of 77 trucks with capacities of up to three tons for handling both import and export cargo. The most important contribution made by the authority to the handling of palletised cargo has been the development, after many experiments, of the "stevedore's pallet." This has a loading surface measuring 6-ft. by 4-ft. 6-in. and a carrying capacity of three tons. The end bearers are made of steel and have an eye at each end. This equipment combines the function of a pallet for the handing of cargo by fork-lift truck with that of a landing board for the movement of cargo by or from the ship's hold. This enables sets of cargo to be moved from stowage in the shed direct into the ship's hold, thereby avoiding delays which would be involved in breaking down pallet loads at the ship's side and then making up sets for shipment. Similar advantages are obtained when discharging from ships.

Concerning exports, the P.L.A. has made arrangements with H.M. Customs and Excise and the shipping companies to meet all requirements of examination, measuring and tallying of palletised cargo. The latest available figure relating to export traffic by the P.L.A. indicates that at certain mechanised berths, excluding uncased vehicles on wheels, about 97 per cent. of cargo is palletised direct from vehicles, and two per cent. after pitching on the shed floor. The final one per cent. cannot or need not be palletised. Among the advantages derived from this form of handling has been a much more economical usage of shed space. Cargo can now be piled up to 16-ft. high, which means that sheds will often accommodate up to 100 per cent. more cargo than would be possible with manual handling. The effect of handling exports by this means can be judged from the average rate of "striking" from road or rail. It has been increased from an average of between eight and 11 tons an hour by manual means to 14 tons and more. Palletisation has increased the speed of ship loading by about 20 per cent.

Dock Delays.

In order to deal effectively with the increased through-put at the London docks the P.L.A. has had to meet not only the exceptionally heavy increases in tonnages forwarded for shipment, but also changed methed of conveyance. This applies in many other ports, particularly those like Bristol, Southampton and Liverpool, where a substantial export trade is carried on. Strong criticism of delays in dealing with export cargo arriving by road at certain docks has been made by several organisations. While some of this criticism is undoubtedly justified it is again impossible to generalise about any allegation of inadequacy on the part of port authorities. In any event the fault does not lie by any means exclusively with the dock organisations. It is still not uncommon for a lorry to arrive at a port with cargo for three or even more ships. The delays in sorting can be readily appreciated. The failure on the part of road hauliers to avert these difficulties of sorting out loads at the docks, and the resultant congestion, are however, being steadily overcome. Another cause of congestion is the tendency for all the lorries for one ship to arrive at one time. A partial solution to the problem of congestion which has been strongly urged is the adoption of a system of staggered receiving dates for a series of ports of call. This would ensure that the arrival of cargo is spread over the whole of the receiving period for vessels.

Most dock authorities are acutely aware of the need for improvement in their facilities for rapid unloading of lorries. Certain measures have been taken but it is doubtful if any authority would claim that these are as extensive as necessary.

Copies of the Review (price 2s. 6d.) can be obtained from the British Productivity Council, 21, Tothill Street, London, S.W.1.

Improved Facilities at Shoreham.

The Shoreham Harbour Trustees announced at their last meeting that work is to be started immediately on the provision of additional transit shed accommodation at their free wharves at Aldrington Basin. Two small sheds on the south side of the basin are to be converted into one large shed and the existing transit shed on the north side of the basin is to be extended by the construction of two additional bays. When these improvements have been completed the total available covered space for transit shed traffic will have been increased to 15,000 square feet. Mr. E. E. Thornton, the chairman of the Works Committee, who submitted the proposal to the Board, stated that a weekly general cargo service between Shoreham and Ostend had recently commenced and in order for the company to increase their import and export trade it was necessary to provide further transit shed accommodation. Additional accommodation would also be required to handle imports of fruit and vegetables from the Continent and the Mediterranean which were to commence at Shoreham in the near future. The Board were also informed that the construction of the new harbour works has progressed considerably in the last two months. The breakwaters would soon be completed and the new lock was expected to be operating in November, when it would be used by the dredging sub-contractors for widening and deepening the channel in the canal.

Retirement of Southampton Docks Manager

Mr. S. A. Finnis to succeed Mr. R. P. Biddle

The British Transport Commission announce that Mr. R. P. Biddle, C.B.E., T.D., J.P., who has been Docks and Marine Manager at Southampton since 1936, will retire from the service on September 30th next.

The Commission have approved the appointment of Mr. S. A. Finnis, at present Chief Docks Manager, Humber Ports, to be Chief Docks Manager, Southampton and Plymouth on Mr. Biddle's retirement. As from that date, the management of the steamship services of the Southern Region of British Railways will be separated from that of the docks. The future arrangements for the management of these services will be announced in due course by the Southern Region.

Mr. R. P. Biddle entered the service of the London and South Western Railway in 1905. He was commissioned in 1915 and served in India, and subsequently with the Expeditionary Force in Palestine until his unit was disbanded. He then received an appointment on the Embarkation Staff, and when demobilised in 1920 was in charge at Port Said. He was then appointed Personal Assistant to the Docks and Marine Manager, became Assistant Docks and Marine Manager in 1933 and succeeded Sir Eustace Missenden as Docks and Marine Manager in 1936.

Mr. R. P. Biddle Mr. S. A. Finnis

In March, 1941 he became Deputy Director of Ports at the Ministry of Transport and resumed his appointment as Docks and Marine Manager in October, 1945 after having been Regional Port Director for the North-West Ports.

Mr. Biddle received the C.B.E. for services in connection with the Planning of the Normandy Invasion. In addition he is an Officer of the Legion of Honour, Chevalier of the Order of Leopold, and holder of the American Medal of Freedom with silver palm. He is also an Officer of the Order of St. John.

As Docks and Marine Manager, Mr. Biddle has been in charge of the administration of Southampton Docks and also Millbay Dock at Plymouth. He has also been responsible for the operation of the Continental and Channel Islands Marine Services of the Southern Region, from Dover to Weymouth and for the Isle of Wight Services from Portsmouth and Lymington.

Mr. Biddle is a member of the B.T.C. Docks Management Board, a Justice of the Peace for the Borough of Southampton, a Governor of Southampton University, Vice-Chairman of Southampton Harbour Board and Chairman of the Southampton Port Employers' Association.

Mr. Sidney Alexander Finnis joined the London and North Eastern Railway in 1927. After experience in various departments, he was appointed Assistant to the District Goods and Dock Manager, West Hartlepool in 1933, and Dock Superintendent, Tyne Dock in 1936. When Tyne Dock was sold to the Tyne Improvement Commission he was transferred to the Divisional General Manager's Office at York, and later to Sunderland as Assistant District Superintendent.

At the outbreak of war, Mr. Finnis was called up with the Supplementary Reserve and went to France as Adjutant of No. 1 Railway Operating Group, R.E. Later he served in the Middle East as Dock Superintendent, Port Said, then became Dock Superintendent, Alexandria, and finally D.A.Q.M.G. (Movements and Transportation), Tobruk, in charge of the working of Tobruk Harbour. He was twice Mentioned in Despatches, but at the fall of Tobruk in 1942 was taken prisoner, being released in April, 1945.

Mr. Finnis returned to the Railway Company as District Superintendent, Sunderland, and, after a short period as Assistant Passenger Manager at York, was appointed Assistant Divisional General Manager, North Eastern Area. On nationalisation he became Assistant Chief Regional Officer, North Eastern Region, and was appointed Chief Docks Manager, Humber Ports in December, 1948.

Mr. Finnis is a member of the Council of the Hull Incorporated Chamber of Commerce and Shipping, and of the Humber Conservancy Board. He is a member of the Council of the National Association of Port Employers and of the Executive Committee of the Hull Association of Port Labour Employers. He also serves on the Transport Users' Consultative Committee (Yorkshire Area) and the Hull University Appointments Board. He is the Chairman of the Port Advisory Committees at Hull, Grimsby and Immingham, and Goole.

A Member of the Institute of Transport, Mr. Finnis was elected to the Council of that body from 1st October, 1955.

The National Dock Labour Scheme

Survey of Year's Activity

The National Dock Labour Board recently issued their report for the year ended 31st December, 1955, together with an announcement of a reduction in the rates of percentage payments on the gross wages of registered dock workers. The rates on daily workers employed on work other than coastal traffic are to be reduced from 13 to 12 per cent. and of those on coastal traffic from 9 to 8 per cent. The percentage payments on the gross wages of weekly workers employed on coastal or other work will remained unchanged at 4 per cent.

Explaining their reasons for the reduction, the Board states that it has examined its current and prospective financial position having regard to the recent increase in the basic rates of wages and such forecasts of future trade as are available. Account has also been taken of the reserves held for levy stabilisation and of the Government's expressed intention to curb inflation and to try to stabilise the cost of living.

Until trade has adjusted itself to the reduction of imports and the increase in exports which are the objectives of the Government's policy, estimates of future income and expenditure must, of necessity, be subject to considerable reservations. The Board has, however, decided to adjust the rates of percentage payment so that, for the time being, no further additions are likely to accrue to its general reserves; and that the calculated risk involved in the reductions, should be accepted in the interests of the national economy.

Union Dispute.

The annual report makes reference to the problems raised by the dispute between the Transport and General Workers' Union and the National Amalgamated Stevedores and Dockers over the intrusion of the latter union into northern ports, which led to problems with regard to the exchange of record books in Liverpool and Manchester at the end of the first quarter. Under arrangements which dated back to the Ministry of War Transport scheme for the Merseyside, Manchester, and Preston areas, membership of the T.G.W.U. had come to be recognised as a requisite to continued registration. The intervention of the N.A.S.D. in Manchester and Liverpool inevitably gave rise to conflicting views as to whether this condition was implicit in the present scheme.

Shortly after a stoppage affecting 11,000 men on Merseyside and 1,500 in Manchester, the Manchester local board decided that, without prejudice to the legal position, new record books should be issued to all registered dock workers without regard to their trade union membership.

National Dock Labour Scheme—continued

Sir Walter Monckton, then Minister of Labour, took the view that, having regard to the serious damage to the national interest, a stoppage of work on this issue should not be allowed to continue or to spread to other ports. He therefore requested that similar action should be taken by the Liverpool local board, on the understanding that such action would be without prejudice to an examination of the matters in dispute, including the legal interpretation of the scheme.

The report recalls that in July a committee of inquiry was set up under the chairmanship of Mr. Justice Devlin to inquire into the working of the dock labour scheme and to advise what alterations, if any, should be made in the terms of the scheme.

In this connection the board submitted a comprehensive memorandum of evidence to the committee in which it gave an account of its experience in carrying out its statutory task of administering the scheme. Subsequently, in December, members of the board were received by the committee and had the opportunity to enlarge on certain aspects of their written statement and to answer questions put to them. Further efforts have been made to assist the committee by supplying supplementary information on additional points as they have been raised.

At the end of the year, both the inter-union dispute and the future administration of the scheme were still sub judice.

National Agreements.

As indicated in the 1954 report, an amendment to the National Docks Agreement of July 3, 1947, became operative on January 10, 1955. The following table shows the increased rates of attendance money and guaranteed payments scheduled by that amendment.

Age	Group	No. of Obligatory Turns Weekly	Attendance Money per Turn	Guaranteed Weekly Payment
Under 65 years ...	A	11	6s. 0d.	£5 4s. 6d.
	C	6	6s. 0d.	£2 17s. 0d.
65-69 years	A	11	6s. 0d.	£3 19s. 9d.
	C	6	6s. 0d.	£2 3s. 6d.
70 years and over ...	C	6	6s. 0d.	No guarantee

The National Joint Council for the Port Transport Industry also agreed to maintain the formula under which the guarantee to non-registered workers is based on elevenths of the guaranteed weekly payment to Group A workers under 65 years of age.

A further agreement was reached by the National Joint Council, which provided that on and after April 18 the national standard time rate of pay should be increased from 24s. to 26s. per day, together with an 8 per cent. increase on former gross piece-work rates; arising from these increases, corresponding adjustments were made in travel time allowances. Subsequently, similar terms were negotiated for those categories of registered dock workers covered by separate agreements.

Commenting on the variations in the volume of trade and of employment during the last five years, the report says that the general movement throughout last year followed a similar pattern in each case. During the first quarter the upward movement corresponded to the exceptional activity following the end of the "overtime" strike, which had seriously disturbed the volume of dock work undertaken in the last quarter of 1954. The recession in the second quarter was an indication of the setback caused by the stoppage attributable to the National Amalgamated Stevedores and Dockers' claim for recognition in ports outside London. The subsequent recovery in the third quarter was maintained until the end of the year, when both trade and employment stood at a higher level than previously recorded.

Labour Position and Policy.

The report goes on to say that the improvement in the level of import and export trade has led to a series of increases in the size of main registers.

Control of the size of the labour force was complicated by the "recognition" strike which seriously affected the volume of work performed during the months of May and June. This dispute not only interrupted the upward trend in activity but, as its aftermath, brought abnormal demands for dock labour, both for ordinary and overtime work. This position was accentuated by the consequential postponement of a large number of annual holidays, which still further increased the need for recruitment in the third quarter.

In these circumstances, it was found impracticable to carry out the customary general review of the sanctioned strength during the first half of the year. Individual requests were, however, received from a number of local boards and specific authorities for recruitment were given.

With the two-fold object of achieving greater flexibility in the labour force and of raising its quality, the National Board has consulted local boards on the desirability of introducing a probationary element as an ingredient of the workers' register. This proposal was, in effect, a logical development from earlier use of temporary registers in a probationary sense, and was felt to be justified as it ensured that local boards would be enabled to exercise a measure of selection in filling vacancies on their main registers, and that men so selected would have had some preliminary experience of dock work. The majority of local boards favoured the introduction of probationary registers, though many of them also wished to adopt seasonal registers to meet recognised short-term increases in trade. In some other cases, the need for probationary registers in addition to seasonal registers was not recognised, while in certain instances it was felt necessary to continue to recruit to the main register in view of the difficulty in obtaining the right type of man on account of the high level of employment prevailing locally.

In reviewing the sanctioned strength in this autumn, the National Board accordingly decided that, in future—

(a) the sanctioned strength should cover separate authorities for the main and—where operated—probationary registers;
(b) whilst local boards could not be required to establish probationary registers, they should be encouraged to do so but without prejudice to the continued use of the designation "temporary" where it was considered desirable locally;
(c) authority given for a probationary register may be exceeded to the extent to which there are vacancies in the main registers.
(d) recruitment for limited periods to meet specific needs be authorised under the designation of "seasonal" registers.
(e) authorities for seasonal registers may be exceeded to the extent to which there are vacancies in the main and probationary registers.

The total sanctioned strength was fixed at 79,115 for the main register and 3,845 for the probationary register. Local boards have continued to give close attention to the size of their registers, so that the actual strength at the end of the year was well below that sanctioned.

The first results of this development of policy have been encouraging, but further time will be needed before its full effect can be assessed; there are, too, a number of detailed implications which are at present receiving the attention of local boards.

During the year, substantially increased use was made of temporary registers; a total of 7,642 was recruited to temporary and seasonal registers, compared with 4,035 in 1954. During the third quarter of the year the average daily number of those on probationary, temporary and seasonal registers rose to 5,110 men.

In regard to intake and outflow of labour, the real turnover has been at a much higher level than previously encountered. For example, no fewer than 2,993 men voluntarily left the main register during the year, while a number of local boards reported their difficulties in retaining men on temporary and seasonal registers unless their weekly earnings could be maintained at an acceptable level.

This movement, the report adds, is no doubt a symptom of the high level of employment which has prevailed in most industries throughout the year. These conditions have greatly increased the difficulties of local boards both in obtaining men of the right quality sufficiently quickly to meet requirements, and in retaining them during the periodic lulls which inevitably arise. An extreme example of this problem arose in Manchester, where an increase of the register by 220 in the course of the year involved interviewing more than 1,700 men, of whom over 1,150 were accepted.

During the year the number of weekly workers rose by 1,317 to 16,866, thus following the trend noted in recent years.

National Dock Labour Scheme—continued

The results of a survey of age groups undertaken during the year showed that, as compared with the previous year's survey, the average age of daily workers on the main registers fell from 46.4 to 45.5 years. At around 24 per cent. of the total, men under 35 now account for a larger proportion of the labour force than has hitherto been recorded.

Surplus Labour.

The average surplus labour at the end of 1954 was very low in relation to the total register and abnormal activity during the first quarter inevitably reduced the daily surplus still further, until the position had geen to some extent restored by additional recruitment. The setback due to the "recognition" strike during the second quarter increased the daily surplus figure, but this was again overtaken by the increased activity which followed resumption of work in the affected ports.

Relative stability in the volume of employment was accordingly not attained until the fourth quarter, by which time the total of available labour was increasing week by week as men returned from their holidays. It was not then possible to assess the effect of the Government's steps to reduce home consumption and it would have been premature to prune registers drastically until the pattern of future trade had been revealed more clearly. Consequently, surpluses at the end of the year were at a higher general level than at its commencement; viewed as a percentage of the total, however, they were not sufficiently large to cause immediate concern.

Attendance money payable amounted to £772,848, compared with £620,750 in 1954, while make-up to the guaranteed minimum involved an expenditure of £49,956, compared with £27,258. Bearing in mind the increased rates applicable under this heading last year, the larger registers, and the difficulties encountered, it is felt that the results for the year as a whole were not unsatisfactory.

The general level of employment and the tendency for all ports to be busy at the same time still further reduced the possibility of meeting temporary shortages by means of period transfers on a voluntary basis.

Local boards have sought to mitigate shortages of a short term character by the use of non-registered labour, but in view of the general employment situation it is not surprising that the assistance obtained from this source last year was at a lower level than in the preceding year.

The main features of the costs of operation have been the increases in the total of wages, in the rates of attendance money and guarantee make-up, and to a lesser extent, in costs of administration. Nevertheless, the relationship between the labour force and the volume of work was such that the total cost over the year was reduced from 13.5 per cent. to 13.2 per cent. of daily workers' wages.

Training and Welfare.

In regard to training, the board has continued to accept responsibility for the cost of training specialists where it has been demonstrated that they are needed in order to ensure a balanced labour force.

The schemes for the training of deal porters in London and Hull initiated in 1954 were continued to meet the needs of the 1955 timber season and resulted in 162 men qualifying during the year. Other specialist training has been given to checkers in a number of ports, crane drivers in Liverpool and Manchester, and contribution as previously has been made to the training of lighterage apprentices in London. In total the expenditure under this heading amounted to £8,887, compared with £3,476 in the previous year.

As in the field of general recruitment, the situation has been affected by competition with other branches of industry. This has been particularly evident in the case of crane drivers at Manchester, where the board has been exercised to arrest the tendency for men to seek alternative employment shortly after completing their training at the board's expense.

During the year the board has had under consideration with the National Joint Council details of a scheme for the training of crane drivers in London; a comprehensive programme has been prepared by the Port of London Authority, who are willing to undertake the necessary supervision and provide the plant. At the end of the year it was hoped that volunteers would shortly be forthcoming to enable a start to be made.

Dealing with welfare, the report states that at the end of the year the board was operating 43 medical centres in 25 ports, staffed by 60 state registered nurses under the supervision of four regional medical officers. The centre formerly in use at South Shields was replaced by a new first aid room, and the Graving Dock centre in Glasgow, which primarily served the needs of other than registered dock workers, was handed over to the control of the Clyde Navigation Trust.

To stimulate support from registered dock workers for the Port Workers' Education Scheme, the board, after consultation with the various bodies concerned, authorised a grant of £10 to those who succeeded in obtaining the group certificate of the Institute of Transport. It was encouraging to note that during the autumn term of 1955,116 registered dock workers enrolled for classes held in connection with the education scheme, compared with 62 in the corresponding term of 1954.

Financial Position.

Despite the effect of the strikes, the high level of employment during the remainder of the year and the continuing development of the labour policy resulted in the board's finances being further strengthened.

The increase in the rates of attendance money and guaranteed weekly payments and the subsequent change in the rates of wages brought automatic and substantial additions to income and expenditure. The effects of these alterations on its current and prospective financial position were examined by the board in May, against the background of its growing reserves; and it was decided that the rates of percentage payments should be adjusted so as to offset the major part of the average net income which would otherwise have accrued from these causes and from the higher average employment.

The adjustments were expected to reduce the income for 1955 by about £290,000, and by about £545,000 in a full year.

Employment was, however, well maintained during the second half of the year and the actual loss of income last year was somewhat under half of the estimated £290,000.

The income from this source therefore totalled £5,295,134, out of which the customary appropriation at ½ per cent. on the wages of all workers—a sum of £233,386—was made to general welfare fund. This was again more than sufficient to meet the expenditure on welfare services.

The board's total expenditure rose from £3,957,711 in 1954, to £4,717,356 in 1955, though this latter figure represented a lower percentage on the increased total wages of daily workers. Ordinary expenditure amounted to £4,364,828.

The valuation of investments at December 31 had fallen by nearly £150,000 as compared with the previous year, and after making the necessary appropriation from contingencies' fund, the provision now held for this purpose amounts to £170,019. It is expected, however, that most if not all of the board's investments will be held until their redemption dates and that these provisions will ultimately be unnecessary.

Plans to Improve Facilities at the Port of Sunderland.

Four schemes for the provision of new equipment at the Port of Sunderland and the improvement of port and harbour facilities have been prepared by the River Wear Commissioners. It is proposed to spend £120,000 on four extra cranes and grabs to handle the growing volume of imports, particularly scrap cargoes. Improvements are also planned at the railway exchange sidings, a third new diesel-electric locomotive is to be bought, and £17,600 is to be spent on improvements to the old North Pier at the river entrance. This latter scheme includes a proposal to remove part of the pier.

Sunderland Town Council have been asked to guarantee the payment, principal and interest on the borrowing on mortgages by the commissioners, of a sum not exceeding £168,410 following the recommendation of the Corporation finance committee.

The Missions to Seamen

World-wide Centenary Celebrations

(Specially Contributed)

The Missions to Seamen, popularly known by seafarers as the "Flying Angel" is a Church of England organisation which was founded in 1856 for the purpose of caring for the well-being of seafarers of all ranks, races and religions throughout the world.

Today, 100 years later, the "Flying Angel" ministers in some twenty-nine stations at home and fifty-one abroad, and also in many other ports along the trade routes of the world, through the services of fifty-three Chaplains and twenty-nine Lay Readers maintained by the General Fund of the Society, as well as more than eighty other workers including full-time Chaplains and Lay Readers, appointed and paid locally, together with Grant and Honorary Chaplains.

The centenary celebrations of the Missions to Seamen, which began on the 25th February with a service of commemoration and thanksgiving in Westminster Abbey, will continue until May 1957. It is said that the Rev. John Ashley started this mission work in 1837 when he visited ships anchored in the Bristol Channel, but it is also known that the Rev. Horatio Montague had been calling on ships in the Pool of London since 1825. He was attached to the London Episcopal Floating Church Society, to whom the Admiralty lent H.M.S. "Brazen" and which was supported by the Church of England. In 1844, the Thames Church Mission started in connection with the Episcopal Society and carried on independently until it was incorporated with the Missions to Seamen in 1904.

The Rev. John Ashley was compelled by ill health to give up his mission work in the Bristol Channel in 1850 and it was not until five years later that the work was resumed as the Bristol Mission to Seamen. Upon the work being extended to the English Channel, two chaplains were appointed, one of whom was the Rev. T. C. Childs who had his headquarters at Ryde on the Isle of Wight. His mission covered an area from Plymouth to the Sussex coast. A year later was formed the Missions to Seamen and in 1858, a complete amalgamation was negotiated with the Bristol Society and the title of The Missions to Seamen officially adopted.

Extensive Overseas Commitments.

The Mission is noteworthy for the good it has done and is doing throughout the world, for, because of the inescapable isolation of the seaman's calling, he needs and appreciates friendly and hospitable contact with shore life, especially overseas. The aim of the Mission is to provide a Padre in every port of the oceans—where he is really needed. Nowadays, in any of the Mission's 80 Institutes and Hostels a seafarer will find a warm welcome, food and refreshment, a chance to enjoy a variety of recreations in a cheerful atmosphere; sometimes a bed for the night, a quiet place to read and write, and someone competent and understanding to whom he can go for advice in resolving any personal problems. In the chapel, too, he is able to find a peaceful place where he can say his prayers or join in the services which are held daily.

At Cardiff this disused 42-gun frigate H.M.S. "Thisbe," lent by the Admiralty to the Missions to Seamen in 1864, served as a floating church and institute for many years.

Interior of the Missions to Seamen Institute at Pernis, the oil port near Rotterdam.

On the Continent, the Rotterdam station of the Mission to Seamen is one of the most well-known. It is more than sixty years old and has, as one of its advantages, the fact that the church of the British community is alongside it and is shared by seamen. The Mission building has a large hall and stage, a fully equipped canteen and other rooms used for social activities. The Mission launch calls at the ships to collect any of the crews who wish to come ashore. Dances at the Mission are particularly popular and the launch takes every man back to his ship afterwards. Two branches of the Rotterdam Mission have been opened since the last war, one at Schiedam and the other near the oil tanker berths at Pernis. The latter is particularly attractive and well attended, for Pernis is too far away from the main Mission for the tanker crews to go there in the short time available to them.

United Kingdom Activities.

The Port of London Mission also covers a wide area, the main Mission being in the heart of dockland in the Victoria Dock Road. This has sleeping accommodation for 150 men, and there is a chapel for services and the Jellicoe Hall for entertainment. A cinema, television and a fine canteen are provided. As in other ports, the Mission Chaplains visit the seamen in ships and in hospital. Incidentally, many Chinese sailors visit the Port of London and in 1954 the first Chinese lay reader in the service of the Mission arrived to make regular visits to ships with Chinese crews.

In October 1954, Athlone House, the Mission at Tilbury was opened by the Duke of Edinburgh. This replaced the one destroyed during the second world war and meets a great need, for the largest passenger ships visiting London are berthed at Tilbury, and an increasing number of large oil tankers berth at the oil refineries at Shell Haven, Thames Haven and Coryton.

Further, because of the extent of the Port of London, and the large number of vessels that berth at buoys in the river, the m.v. "John Ashley" was acquired from the Admiralty in 1951 to make it possible for these ships to be visited. She has a length of 61½-ft., a beam of 18-ft. and a speed of seven knots. Her large hold is fitted as a comfortable saloon and there is a library of books for reading on board or distribution to ships. Woollen comforts stored in lockers are also distributed and there is a dartboard, piano, television set and cinema equipment. At the after end, there is a curtained sanctuary from which to conduct services. As well as the padre in charge of the floating mission, the "John Ashley" carries a captain and an engineer and, in covering about 6,500 miles in a year calls on over 2,000 ships. In 1954, 17,000 seamen visited her; 188 cinema shows were attended by 3,880 men and 199 services were attended by 3,605 men.

In the Port of Southampton also, apart from the facilities pro-

The Missions to Seamen—continued

vided at the pleasant Mission building in Queen's Terrace, the "Flying Angel" goes afloat every Wednesday and Sunday in the Mission's 40-ft. twin-screw launch "Mendell." So it is in many other ports throughout the world, and ship-visiting is carried out where it is not possible for the crews to get ashore. In the last recorded year, the Missions' Chaplains and workers visited more than 57,000 ships, as well as paying more than 5,500 visits to hospitals, arranging nearly 12,500 entertainments and conducting some 13,500 services.

New Station in West Africa.

An example of the way in which the work of the Mission is always expanding is the fact that plans are in hand to open a new station at the Port of Walvis Bay, which will be the first Missions to Seamen station on the South-West African coast. Walvis Bay is very much in need of such a service as, over the past five years, the traffic has grown to nearly 250 vessels a year. This figure does not include regular visits by Thesen's coasters, or the 150 fishing

The Missions' ship "John Ashley" is a floating church and recreational centre for seamen visiting the Thames.

boats operating for the fish factories at the port. In view of this expansion in shipping and trade, the South African Railways Administration is planning to increase the capacity of the harbour.

Realising both the development and the need, the Missions to Seamen in London, on the urgent recommendation of the people of Walvis Bay, have sent a chaplain to open a station, but they made it quite clear that no financial help could be given.

However, in 1897, when the Rev. A. Williams was sent from London to start a mission at Cape Town, a cheque for £10 was given to him. With this small sum and the generous support of the people of Cape Town, he built a club which has since welcomed many visiting seamen. History recently repeated itself when the chaplain of the Cape Town mission presented the new chaplain to Walvis Bay with a cheque for £50, which is the estimated present-day value of that £10. The shipping companies have also been generous and there have been other donations, but much financial assistance is still required.

The distinctive flag showing an angel in flight is to be seen flying over every Missions to Seamen establishment in the world. The symbol of the white flying angel, carrying the "Everlasting Gospel" in the form of an open book in the left hand on a rectangular navy blue flag was adopted as the official Missions to Seamen flag in 1858. The idea was conceived when reading verse 6, chapter 14 of the Book of Revelations:

"And I saw another angel fly from heaven having the everlasting gospel to preach unto them that dwell on the earth, and to every nation and kindred and people."

This verse seemed to express all that the Missions hoped to do.

Water Pollution Research, 1955

In their Annual Report for 1955, published early this month the Water Pollution Research Board review the first complete year's work which has been carried out in their new Research Laboratory at Stevenage. With the facilities now available it has been possible for the organisation to collaborate much more closely than formerly with other bodies interested in the prevention of pollution. For example, members of the staffs of the Ministry of Agriculture, Fisheries and Food, the National Coal Board, and the Freshwater Biological Association are now temporarily accommodated at Stevenage and are working with the Laboratory's own staff on particular problems of pollution.

The Report of the Director of Research, which accompanies that of the Board, summarises briefly the results of the chief investigations made during the year, of which the following are examples.

Survey of the Thames Estuary.

In estimating the relative importance of polluting discharges to the estuary the effect of rainfall is important. On one day of heavy rain, for example, the polluting load from storm water discharges was about one-fifth of the total load, whereas the average is only about 1 per cent. Rain also increased the flow from the outfall works of the London County Council.

In order to calculate the effect of polluting matter on the state of oxygenation of the estuary it is necessary to know the rate at which the water absorbs oxygen from the air. It has been found that several factors affect this, among them temperature and salinity, and the presence of sewage effluent (which causes a small reduction), settled sewage (a big reduction), and synthetic detergents which cause a relatively big reduction which is, however, less in water already containing sewage than in clean water.

The final calculations on the effect of different factors on the state of oxygenation of the estuary are not yet finished, but calculations giving the effect of heated effluents on the distribution of temperature have been completed. There is quite good agreement between predicted and observed distribution of temperature.

Oxygen in Fresh-Water Streams.

An investigation has been begun on the effect of pollution by effluents containing organic matter on the oxygen content of streams. The chief difficulty in this is to measure the rate at which the water dissolves oxygen from the air—a matter on which there has hitherto been very little direct observation. The method now being adopted, where it can be used with safety, is to lower the oxygen content of a stream by addition of a reducing chemical and then to observe directly the rate of re-oxygenation. In a polluted stream the oxygen content at a given point may vary very widely from time to time and the work has emphasised how misleading an impression of the state of a river may be given by considering a single set of observations.

Effects of Pollution on Fish.

The Director's Report contains a note from the Ministry of Agriculture, Fisheries and Food on the progress they have made in the development of a standard test for the toxicity to fish of sewage or industrial effluents. The chief difficulty encountered is in aerating the mixture of water and effluent to be tested without causing excessive loss of volatile substances, some of which may be poisonous. It is clear that more experimental work will have to be done on this method before it can be used as a standard procedure.

Treatment of Sewage.

Laboratory experiments have been made with percolating filters ventilated with mixtures of oxygen and nitrogen in different proportions. If the proportion of oxygen in the mixture is reduced the first effect is to reduce nitrification. It appears that the supply of oxygen by natural ventilation of a filter is not normally a factor which limits the rate at which sewage can be treated within the range of rates used at a sewage works.

In experiments with pilot-scale percolating filters treating sewage containing synthetic detergents, when the detergents were first applied very little passed through the filtering medium. There-

Water Pollution Research—continued

after the proportion discharged with the effluent gradually increased to a value between 30 and 40 per cent. of the amount applied—a result which seems to be in general agreement with observations from large-scale practice.

Industrial Waste Waters.

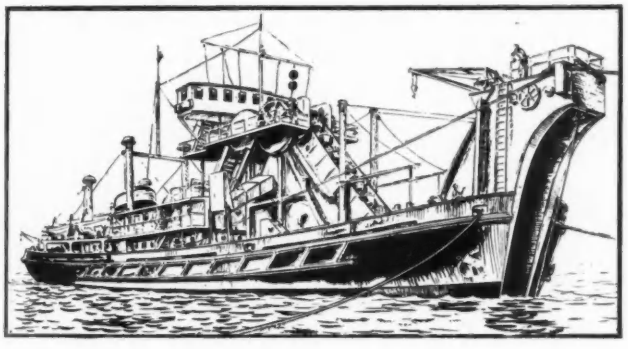
Work carried out during the year included studies with pilot plant on the biological destruction of cyanide, and with small-scale plant on the anaerobic digestion of meat wastes, the treatment of washing waters from cattle sheds, and the treatment of waste oil-in-water emulsions. A large-scale plant based on the work of the Laboratory is now operating at an aerodrome for the treatment of emulsions resulting from the washing of aircraft.

"Water Pollution Research 1955" is published by H.M.S.O. for D.S.I.R., price 4s. (72 cents U.S.A.) by post 4s. 3d.

Manufacturers' Announcements

New Self-Propelled Bucket Dredger

A new self-propelled bucket dredger was recently launched at Sliedrecht. Constructed by the Industrial Trading Corporation, Holland, the vessel has a length of 58 metres, a width of 11.20 metres, a depth of 4.40 metres and a draft of 2.85 metres. The dredger, which has a sea-going speed of 10 knots, is powered by a "Brouwer" totally enclosed type steam engine developing 1,000 I.H.P. which drives either the propeller or the dredge pump. A 250 I.H.P. engine of the same type is installed for driving the bucket chain, and all engine room auxiliaries and deck winches are also steam driven.



Artist's impression of the new dredger.

Steam is obtained from two Scotch type boilers each with a steam pressure of 14.5 kg. per sq. cm. Both are suitable for firing coal or burning liquid fuel and are worked with a forced draught installation. A steam driven generator provides electric power for lighting the vessel and a diesel harbour generating set is installed for use when steam is not available.

Soil can be dredged at a maximum rate of 450 cubic metres per hour by 47 buckets, each with a capacity of 500 litres and the design of the buckets also enables them to dredge heavy hard loam. The normal dredging depth is 12 metres although a maximum depth of 14 metres can be attained. The dredged soil is pumped ashore through a floating and shore pipeline of a total length of 600 metres by a dredge pump with a capacity of 450 cubic metres of soil per hour.

The vessel can accommodate a crew of 36 and is capable of sailing 1,200 miles without refuelling.

Navigator Chain for East Pakistan

The Shell Company of Pakistan have signed an agreement with the Decca Navigator Company for the supply of a Decca Navigator Chain for use in Eastern Pakistan. This follows the successful use of Decca Navigator Chains by Shell in Borneo, the Persian Gulf and the Sahara.

The new Chain, consisting of four transmitters, will be capable of providing an accurate position fixing network over the Bay of Bengal and the adjoining land areas. Although on a smaller scale, with resulting higher accuracy, the system is basically the same as that used by over 3,200 ships and aircraft for navigation in Europe, and will be used by Shell to position their ship and land survey parties; it will also be used by aircraft employed in connection with the exploration programme.

New Truck-Mount

Developed in Canada by Messrs. Priestman Brothers Ltd., chiefly for work on the St. Lawrence Seaway Project, the "Caribou" is the first British Excavator/Crane of its capacity to combine a high lifting duty crane with a specially built carrier chassis for movement under its own power, at lorry speed.

Its functional, six-wheel drive chassis, formed from 12-in. x 8-in. "I" section rolled steel, with cross members of the same section, combines immense strength with maximum stability and can successfully negotiate the most difficult site conditions on its special earth-moving tyres. The unique 36-roller ring and oil-immersed centre post permit the lifting of loads far in excess of those usually associated with a machine of this size.

The "Caribou" can deal with lifts of up to 6 tons, and its 25-ft. 2-piece jib can be extended to 65-ft. in 10-ft. lengths. The high-duty derricking unit, also oil-immersed, permits raising or lowering of the jib under power, with the load suspended.

A special derricking harness and handy derrick rope braces, corresponding in length to the jib inserts, cut down time in adjusting the jib length. To jibs up to 45-ft. in length a 10-ft. "goose-neck" extension may be added to facilitate the lifting of awkwardly shaped loads, or to give clearance over buildings, etc.

Every section of the jib is equipped with lugs on the upper and lower joint flanges, so that it can be folded and stowed on the "headache" rest for long distance travelling.

The "Caribou" is provided with two independently operated rope drums and conversion to grab or dragline operation is therefore an easy matter.

A choice of six front ends is available and standard Priestman 3/8 cu. yd. crowd shovel and dragshovel equipments may be fitted, in place of the long jib, with the minimum loss of time.

Manufacturers' Announcements—continued

New Diesel Industrial Truck

A new diesel-powered truck has been manufactured by R. A. Lister and Company Ltd., of Dursley. It is the platform model Lister LD Auto-Truck which has been designed to meet the demands of modern labour-saving methods by users in a wide field of industry and commerce.

Light in weight, hlghly manœuvrable, yet easily handled, the truck is driven by a 3½ h.p. Lister air-cooled diesel engine, which is a self-contained unit with its own oil and fuel tanks. The maximum load is 2,000 lbs. and the platform has a loading area of 17½ square feet. Slots are provided to enable 7-in. high detachable side and end boards to be fitted if required. A towing attachment may be fitted to the rear of the chassis to enable the truck to haul a trailer under suitable conditions.

The new Lister Auto-Truck at work on dock side.

The total weight of the truck is 8 cwt. 3 qrs., and the wheel base 6-ft. The overall length is just under 9½-ft. and the width 3-ft. 7½-in. The loading platform length extends to 5-ft. and the platform height is just under 18-in. The truck can be supplied either as a two-gear model, or, if working terrain is flat, with single gear.

Harbour Radar for India

The increased industrial and agricultural production together with the development of the mineral resources of the hinterland has, for some years past, created extensive congestion in the Port of Bombay. The decision, made in 1948 by the Government of India, to develop Kandla in the Gulf of Kutch as a major deep sea port to handle the output from the Punjab and Delhi is, therefore, of considerable importance to the future expansion of Indian trade.

Kandla Creek is the only natural deep harbour occurring in the Gulf of Kutch and its geographical position is well chosen for services to the hinterland. Another important factor in the selection of Kandla is the combination of a natural deep water harbour adjacent to high land, enabling a port to be constructed quickly and developed to any extent which trade may justify.

In keeping with the far-sighted approach to the problem made by the Government of India, the Lighthouse Department of the Ministry of Transport have placed a contract, as a result of open competitive tender, for the supply and installation of a Decca Type 32 Harbour Radar at the Port of Kandla, to assist the supervision of vessels navigating the approach channels of Tekra Creek to the new harbour.

The Type 32 is the outcome of a long-term investigation by Decca into the requirements for Harbour Radar at major ports, and is claimed to be the most advanced equipment of its kind in the world. The discrimination in range and bearing are of an extremely high order, designed to meet the requirements for the supervision of navigation in dense conditions of traffic.

A further major development now being undertaken by the Department of Lighthouses is the scheme for the installation of radar on lighthouses to assist navigation in coastal waters. Decca Radar Type 30A has already been chosen for the first stage of this new development programme, and it will be fitted at Saugore and Khander Island Lighthouses at the approaches to Calcutta and Bombay.

New Automatic Fire Alarm

Associated Fire Alarms Ltd. (A.F.A.) announce that they have been awarded the contract for the installation of a large-scale automatic fire alarm system at H.M. Chatham Dockyard. The system will be a typical A.F.A. arrangement with automatic, heat-sensitive detectors fitted in various parts of the premises, including stores and workshops. The detectors will be connected to a central indicator panel, which will have an indicator for each part of the premises, an alarm bell and a direct connection to the Dockyard Fire Station. All circuits will be under automatic test.

The new installation supplements the original A.F.A. system, one of the company's first contracts, which was installed over 50 years ago and is still in service.

A.F.A. have installed similar systems in ports, dockyards and warehouses throughout the U.K. and are also well known to shipbuilders and owners for their marine type fire detectors and alarm systems now installed in an increasing number of ships and liners.

Asbestos Packings and Millboard.

A new 24-page illustrated booklet, "Asbestos Packings and Millboard," has been issued by The Cape Asbestos Company Ltd., of Park Street, London. It gives in an easily readable style concise details, with photographs, of the "Pluto" and "Capetto" simplified range of Pump, Valve and Piston Packings, Static Boiler and Furnace Packings, Proofed Asbestos Sheeting, Joints and Tape, and Asbestos Millboard.

The complex range of branded packings offered to-day to manufacturing and maintenance engineers is a source of perplexity to any but the specialist, and the "Pluto" and "Capetto" range sets out to provide a simplified range of packings in the highest quality materials capable of fulfilling all the basic requirements.

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